GL: 3-D Graphics

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The `sgl` libraries provide access to the rendering functions of OpenGL 1.5 and GLU 1.3 libraries. The `sgl` libraries to not address system-level concerns, such as the attachment of GL rendering contexts to displays. Instead, the libraries should work with any Racket extension that provides GL with access to the system (such as a binding for `glx`). Notably, the `racket/gui/base` library provides support for rendering contexts via the `canvas%` class and its `with-gl-context` method.

Contents

1 Using OpenGL **3**

2 C-Style OpenGL **4**

3 Racket-Style OpenGL **39**

4 OpenGL Vectors **44**

5 Bitmaps **50**

6 Initialization **51**

Index **52**

Index **52**

1 Using OpenGL

The `sgl/gl` library provides direct access to the C-style OpenGL API, whereas the `sgl` library provides a more Racket-like interface. The `sgl/gl` library provides a binding for each `#defined` constant and for most functions in OpenGL 1.5 and GLU 1.3. The functions perform comparable checking to their C-language counterparts; they check the types of their arguments, but do not check the length of array arguments. The `sgl` library provides wrappers around many of the functions in the `sgl/gl` library to present a more Racket-friendly interface, including function names that follow Racket conventions, and checked, symbolic enumeration arguments, and array-length checks.

Warning on Safety: OpenGL programming is inherently unsafe, even when using only the `sgl` library. Although `sgl` checks the arguments to each function call, violation of higher-level assumptions of the system's OpenGL library can cause it to crash, bringing the entire Racket system down. For example, sending a large number of vertices in a single `glBegin` causes at least some GL implementations to crash.

Some examples are available in the `"examples"` directory of the `"sgl"` collection in the Racket installation. For `"alpha.rkt"`, try choosing the `"sk.jpg"` image distritbuted with Racket in the `"icons"` collection; you may have to press the `t` key a few times if the spinning cube is blank.

2 C-Style OpenGL

```
(require sgl/gl)
```
package: sgl

The sgl/gl module provides a direct interface to the system's GL library closely following the conventions of the C-language OpenGL API. It provides a binding for each #defined constant (these start with GL_) and for the functions in the GL 1.5 and GLU 1.3 specifications, except for the following:

- Vertex arrays (GL 1.5, Section 2.8)
- Buffer objects (GL 1.5, Section 2.9)
- glGetPointerv (GL 1.5, Section 6.1.11)
- Buffer object queries (GL 1.5, Section 6.1.13)
- Polygon tessellation (GLU 1.3, Section 5)
- gluQuadricCallback (GLU 1.3, Section 6.2)
- NURBS callbacks (GLU 1.3, Section 7.2)

If one of the provided functions is not present on your system (e.g. if your system supports only GL 1.3), then the corresponding sgl/gl function raises a run-time exception when invoked.

The functions provided by sgl/gl perform comparable checking to their C-language counterparts; they check the types of their arguments, but do not check the length of array arguments. The following details the kinds of Racket values that can be provided for each primitive OpenGL type:

- GLbyte, GLshort, GLint: exact integer in the proper range
- GLubyte, GLushort, GLuint: exact non-negative integer in the proper range
- GLsizei, GLenum, GLbitfield: exact non-negative integer in the proper range
- GFfloat, GLdouble: real number
- GFclampf, GLclampd: real number
- GLboolean: any value, where #f means GL_FALSE and all other values mean GL_TRUE; do not use GL_FALSE or GL_TRUE, since they are bound to integers, both will end up being converted to GL_TRUE.

OpenGL functions that take vector arguments accept `cvector` values. The type of the `cvector` is checked; for example, `glVertex3fv` expects a vector of `GLfloats`, so `glVertex3fv` accepts only a `cvector` containing reals. See also `sgl/gl-vectors`. Functions that accept arrays of type `void*` accept any `cvector`; you must ensure that you supply the proper kind of vector, as in the C-language OpenGL API.

Examples:

```
(require sgl/gl
         sgl/gl-vectors)
(glBegin GL_TRIANGLES)
(glVertex3i 1 2 3)
(glVertex4fv (gl-float-vector 1 2 3 4))
(glEnd)
```

```
glPixelMapfv : procedure?
glPixelMapuiv : procedure?
glPixelMapusv : procedure?
glDeleteTextures : procedure?
glDeleteQueries : procedure?
```

These functions do not take a size argument, because it is derived from the length of the argument vector.

```
glGenTextures : procedure?
glGenQueries : procedure?
```

These functions do not take vector arguments. Instead, they allocate a vector of the requested size and return it.

```
glAreTexturesResident : procedure?
```

This function takes in a `GLuint` vector and textures, and it returns 2 values: the specified boolean and a boolean vector of residences.

```
glGetBooleanv : procedure?
glGetIntegerv : procedure?
glGetFloatv : procedure?
glGetDoublev : procedure?
glGetLightfv : procedure?
glGetLightiv : procedure?
glGetMaterialfv : procedure?
glGetMaterialiv : procedure?
glGetTexEnvfv : procedure?
glGetTexEnviv : procedure?
```

```
glGetTexGendv : procedure?
glGetTexGenfv : procedure?
glGetTexGeniv : procedure?
glGetTexParameterfv : procedure?
glGetTexParameteriv : procedure?
glGetTexLevelParameterfv : procedure?
glGetTexLevelParameteriv : procedure?
glGetPixelMapfv : procedure?
glGetPixelMapuiv : procedure?
glGetPixelMapusv : procedure?
glGetMapdv : procedure?
glGetMapfv : procedure?
glGetMapiv : procedure?
glGetBufferParameteriv : procedure?
glGetConvolutionParameterfv : procedure?
glGetConvolutionParameteriv : procedure?
glGetHistogramParameterfv : procedure?
glGetHistogramParameteriv : procedure?
glGetMinmaxParameterfv : procedure?
glGetMinmaxParameteriv : procedure?
glGetQueryiv : procedure?
glGetQueryObjectiv : procedure?
glGetQueryObjectuiv : procedure?
```

Instead of taking a vector argument, these function take an integer argument that specifies the size of the vector that is returned.

```
glGetClipPlane : procedure?
```

This function does not take a vector argument and returns a `GLdouble` vector of length 4.

```
glGetString : procedure?
gluCheckExtension : procedure?
gluErrorString : procedure?
gluGetString : procedure?
```

These functions deal with strings instead of `GLubyte` vectors.

```
gluProject : procedure?
gluUnProject : procedure?
gluUnProject4 : procedure?
```

Instead of taking pointers to `GLdoubles` for return values, these function directly return `GLdouble` vectors.

```
glSelectBuffer : procedure?
glFeedbackBuffer : procedure?
```

These functions do not take vectors, instead they return a `selection-buffer-object` or `feedback-buffer-object`. The `select-buffer->gl-uint-vector` and `feedback-buffer->gl-float-vector` functions copy the contents of the buffer into a vector. Because the OpenGL library writes to the buffer-object on OpenGL function calls after `glSelectBuffer` or `glFeedbackBuffer` has returned, if the buffer is garbage collected before OpenGL is finished writing to it, the entire Racket system can crash. The `gl-process-selection` function in `sgl` helps interpret the results of `glSelectBuffer` in a Racket-friendly format.

```
glAccum : procedure?
glActiveTexture : procedure?
glAlphaFunc : procedure?
glBegin : procedure?
glBeginQuery : procedure?
glBindTexture : procedure?
glBitmap : procedure?
glBlendColor : procedure?
glBlendEquation : procedure?
glBlendFunc : procedure?
glBlendFuncSeparate : procedure?
glCallList : procedure?
glCallLists : procedure?
glClear : procedure?
glClearAccum : procedure?
glClearColor : procedure?
glClearDepth : procedure?
glClearIndex : procedure?
glClearStencil : procedure?
glClipPlane : procedure?
glColor3b : procedure?
glColor3bv : procedure?
glColor3d : procedure?
glColor3dv : procedure?
glColor3f : procedure?
glColor3fv : procedure?
glColor3i : procedure?
glColor3iv : procedure?
glColor3s : procedure?
glColor3sv : procedure?
glColor3ub : procedure?
glColor3ubv : procedure?
glColor3ui : procedure?
```

```
glColor3uiv : procedure?
glColor3us : procedure?
glColor3usv : procedure?
glColor4b : procedure?
glColor4bv : procedure?
glColor4d : procedure?
glColor4dv : procedure?
glColor4f : procedure?
glColor4fv : procedure?
glColor4i : procedure?
glColor4iv : procedure?
glColor4s : procedure?
glColor4sv : procedure?
glColor4ub : procedure?
glColor4ubv : procedure?
glColor4ui : procedure?
glColor4uiv : procedure?
glColor4us : procedure?
glColor4usv : procedure?
glColorMask : procedure?
glColorMaterial : procedure?
glColorSubTable : procedure?
glColorTable : procedure?
glColorTableParameterfv : procedure?
glColorTableParameteriv : procedure?
glCompressedTexImage1D : procedure?
glCompressedTexImage2D : procedure?
glCompressedTexImage3D : procedure?
glCompressedTexSubImage1D : procedure?
glCompressedTexSubImage2D : procedure?
glCompressedTexSubImage3D : procedure?
glConvolutionFilter1D : procedure?
glConvolutionFilter2D : procedure?
glConvolutionParameterf : procedure?
glConvolutionParameterfv : procedure?
glConvolutionParameteri : procedure?
glConvolutionParameteriv : procedure?
glCopyColorSubTable : procedure?
glCopyColorTable : procedure?
glCopyConvolutionFilter1D : procedure?
glCopyConvolutionFilter2D : procedure?
glCopyPixels : procedure?
glCopyTexImage1D : procedure?
glCopyTexImage2D : procedure?
glCopyTexSubImage1D : procedure?
```

```
glCopyTexSubImage2D : procedure?
glCopyTexSubImage3D : procedure?
glCullFace : procedure?
glDeleteLists : procedure?
glDepthFunc : procedure?
glDepthMask : procedure?
glDepthRange : procedure?
glDisable : procedure?
glDrawBuffer : procedure?
glDrawPixels : procedure?
glEdgeFlag : procedure?
glEdgeFlagv : procedure?
glEnable : procedure?
glEnd : procedure?
glEndList : procedure?
glEndQuery : procedure?
glEvalCoord1d : procedure?
glEvalCoord1dv : procedure?
glEvalCoord1f : procedure?
glEvalCoord1fv : procedure?
glEvalCoord2d : procedure?
glEvalCoord2dv : procedure?
glEvalCoord2f : procedure?
glEvalCoord2fv : procedure?
glEvalMesh1 : procedure?
glEvalMesh2 : procedure?
glEvalPoint1 : procedure?
glEvalPoint2 : procedure?
glFinish : procedure?
glFlush : procedure?
glFogCoordd : procedure?
glFogCoorddv : procedure?
glFogCoordf : procedure?
glFogCoordfv : procedure?
glFogf : procedure?
glFogfv : procedure?
glFogi : procedure?
glFogiv : procedure?
glFrontFace : procedure?
glFrustum : procedure?
glGenLists : procedure?
glGetColorTable : procedure?
glGetCompressedTexImage : procedure?
glGetConvolutionFilter : procedure?
glGetError : procedure?
```

```
glGetHistogram : procedure?
glGetMinmax : procedure?
glGetPolygonStipple : procedure?
glGetSeparableFilter : procedure?
glGetTexImage : procedure?
glHint : procedure?
glHistogram : procedure?
glIndexMask : procedure?
glIndexd : procedure?
glIndexdv : procedure?
glIndexf : procedure?
glIndexfv : procedure?
glIndexi : procedure?
glIndexiv : procedure?
glIndexs : procedure?
glIndexsv : procedure?
glIndexub : procedure?
glIndexubv : procedure?
glInitNames : procedure?
glIsBuffer : procedure?
glIsEnabled : procedure?
glIsList : procedure?
glIsQuery : procedure?
glIsTexture : procedure?
glLightModelf : procedure?
glLightModelfv : procedure?
glLightModeli : procedure?
glLightModeliv : procedure?
glLightf : procedure?
glLightfv : procedure?
glLighti : procedure?
glLightiv : procedure?
glLineStipple : procedure?
glLineWidth : procedure?
glListBase : procedure?
glLoadIdentity : procedure?
glLoadMatrixd : procedure?
glLoadMatrixf : procedure?
glLoadName : procedure?
glLoadTransposeMatrixd : procedure?
glLoadTransposeMatrixf : procedure?
glLogicOp : procedure?
glMap1d : procedure?
glMap1f : procedure?
glMap2d : procedure?
```

```
glMap2f : procedure?
glMapGrid1d : procedure?
glMapGrid1f : procedure?
glMapGrid2d : procedure?
glMapGrid2f : procedure?
glMaterialf : procedure?
glMaterialfv : procedure?
glMateriali : procedure?
glMaterialiv : procedure?
glMatrixMode : procedure?
glMinmax : procedure?
glMultMatrixd : procedure?
glMultMatrixf : procedure?
glMultTransposeMatrixd : procedure?
glMultTransposeMatrixf : procedure?
glMultiTexCoord1d : procedure?
glMultiTexCoord1dv : procedure?
glMultiTexCoord1f : procedure?
glMultiTexCoord1fv : procedure?
glMultiTexCoord1i : procedure?
glMultiTexCoord1iv : procedure?
glMultiTexCoord1s : procedure?
glMultiTexCoord1sv : procedure?
glMultiTexCoord2d : procedure?
glMultiTexCoord2dv : procedure?
glMultiTexCoord2f : procedure?
glMultiTexCoord2fv : procedure?
glMultiTexCoord2i : procedure?
glMultiTexCoord2iv : procedure?
glMultiTexCoord2s : procedure?
glMultiTexCoord2sv : procedure?
glMultiTexCoord3d : procedure?
glMultiTexCoord3dv : procedure?
glMultiTexCoord3f : procedure?
glMultiTexCoord3fv : procedure?
glMultiTexCoord3i : procedure?
glMultiTexCoord3iv : procedure?
glMultiTexCoord3s : procedure?
glMultiTexCoord3sv : procedure?
glMultiTexCoord4d : procedure?
glMultiTexCoord4dv : procedure?
glMultiTexCoord4f : procedure?
glMultiTexCoord4fv : procedure?
glMultiTexCoord4i : procedure?
glMultiTexCoord4iv : procedure?
```

```
glMultiTexCoord4s : procedure?
glMultiTexCoord4sv : procedure?
glNewList : procedure?
glNormal3b : procedure?
glNormal3bv : procedure?
glNormal3d : procedure?
glNormal3dv : procedure?
glNormal3f : procedure?
glNormal3fv : procedure?
glNormal3i : procedure?
glNormal3iv : procedure?
glNormal3s : procedure?
glNormal3sv : procedure?
glOrtho : procedure?
glPassThrough : procedure?
glPixelStoref : procedure?
glPixelStorei : procedure?
glPixelTransferf : procedure?
glPixelTransferi : procedure?
glPixelZoom : procedure?
glPointParameterf : procedure?
glPointParameterfv : procedure?
glPointParameteri : procedure?
glPointParameteriv : procedure?
glPointSize : procedure?
glPolygonMode : procedure?
glPolygonOffset : procedure?
glPolygonStipple : procedure?
glPopAttrib : procedure?
glPopClientAttrib : procedure?
glPopMatrix : procedure?
glPopName : procedure?
glPushAttrib : procedure?
glPushClientAttrib : procedure?
glPushMatrix : procedure?
glPushName : procedure?
glRasterPos2d : procedure?
glRasterPos2dv : procedure?
glRasterPos2f : procedure?
glRasterPos2fv : procedure?
glRasterPos2i : procedure?
glRasterPos2iv : procedure?
glRasterPos2s : procedure?
glRasterPos2sv : procedure?
glRasterPos3d : procedure?
```

```
glRasterPos3dv : procedure?
glRasterPos3f : procedure?
glRasterPos3fv : procedure?
glRasterPos3i : procedure?
glRasterPos3iv : procedure?
glRasterPos3s : procedure?
glRasterPos3sv : procedure?
glRasterPos4d : procedure?
glRasterPos4dv : procedure?
glRasterPos4f : procedure?
glRasterPos4fv : procedure?
glRasterPos4i : procedure?
glRasterPos4iv : procedure?
glRasterPos4s : procedure?
glRasterPos4sv : procedure?
glReadBuffer : procedure?
glReadPixels : procedure?
glRectd : procedure?
glRectdv : procedure?
glRectf : procedure?
glRectfv : procedure?
glRecti : procedure?
glRectiv : procedure?
glRects : procedure?
glRectsv : procedure?
glRenderMode : procedure?
glResetHistogram : procedure?
glResetMinmax : procedure?
glRotated : procedure?
glRotatef : procedure?
glSampleCoverage : procedure?
glScaled : procedure?
glScalef : procedure?
glScissor : procedure?
glSecondaryColor3b : procedure?
glSecondaryColor3bv : procedure?
glSecondaryColor3d : procedure?
glSecondaryColor3dv : procedure?
glSecondaryColor3f : procedure?
glSecondaryColor3fv : procedure?
glSecondaryColor3i : procedure?
glSecondaryColor3iv : procedure?
glSecondaryColor3s : procedure?
glSecondaryColor3sv : procedure?
glSecondaryColor3ub : procedure?
```

```
glSecondaryColor3ubv : procedure?
glSecondaryColor3ui : procedure?
glSecondaryColor3uiv : procedure?
glSecondaryColor3us : procedure?
glSecondaryColor3usv : procedure?
glSeparableFilter2D : procedure?
glShadeModel : procedure?
glStencilFunc : procedure?
glStencilMask : procedure?
glStencilOp : procedure?
glTexCoord1d : procedure?
glTexCoord1dv : procedure?
glTexCoord1f : procedure?
glTexCoord1fv : procedure?
glTexCoord1i : procedure?
glTexCoord1iv : procedure?
glTexCoord1s : procedure?
glTexCoord1sv : procedure?
glTexCoord2d : procedure?
glTexCoord2dv : procedure?
glTexCoord2f : procedure?
glTexCoord2fv : procedure?
glTexCoord2i : procedure?
glTexCoord2iv : procedure?
glTexCoord2s : procedure?
glTexCoord2sv : procedure?
glTexCoord3d : procedure?
glTexCoord3dv : procedure?
glTexCoord3f : procedure?
glTexCoord3fv : procedure?
glTexCoord3i : procedure?
glTexCoord3iv : procedure?
glTexCoord3s : procedure?
glTexCoord3sv : procedure?
glTexCoord4d : procedure?
glTexCoord4dv : procedure?
glTexCoord4f : procedure?
glTexCoord4fv : procedure?
glTexCoord4i : procedure?
glTexCoord4iv : procedure?
glTexCoord4s : procedure?
glTexCoord4sv : procedure?
glTexEnvf : procedure?
glTexEnvfv : procedure?
glTexEnvi : procedure?
```

```
glTexEnviv : procedure?
glTexGend : procedure?
glTexGendv : procedure?
glTexGenf : procedure?
glTexGenfv : procedure?
glTexGeni : procedure?
glTexGeniv : procedure?
glTexImage1D : procedure?
glTexImage2D : procedure?
glTexImage3D : procedure?
glTexParameterf : procedure?
glTexParameterfv : procedure?
glTexParameteri : procedure?
glTexParameteriv : procedure?
glTexSubImage1D : procedure?
glTexSubImage2D : procedure?
glTexSubImage3D : procedure?
glTranslated : procedure?
glTranslatef : procedure?
glVertex2d : procedure?
glVertex2dv : procedure?
glVertex2f : procedure?
glVertex2fv : procedure?
glVertex2i : procedure?
glVertex2iv : procedure?
glVertex2s : procedure?
glVertex2sv : procedure?
glVertex3d : procedure?
glVertex3dv : procedure?
glVertex3f : procedure?
glVertex3fv : procedure?
glVertex3i : procedure?
glVertex3iv : procedure?
glVertex3s : procedure?
glVertex3sv : procedure?
glVertex4d : procedure?
glVertex4dv : procedure?
glVertex4f : procedure?
glVertex4fv : procedure?
glVertex4i : procedure?
glVertex4iv : procedure?
glVertex4s : procedure?
glVertex4sv : procedure?
glViewport : procedure?
glWindowPos2d : procedure?
```

```
glWindowPos2dv : procedure?
glWindowPos2f : procedure?
glWindowPos2fv : procedure?
glWindowPos2i : procedure?
glWindowPos2iv : procedure?
glWindowPos2s : procedure?
glWindowPos2sv : procedure?
glWindowPos3d : procedure?
glWindowPos3dv : procedure?
glWindowPos3f : procedure?
glWindowPos3fv : procedure?
glWindowPos3i : procedure?
glWindowPos3iv : procedure?
glWindowPos3s : procedure?
glWindowPos3sv : procedure?
gluBuild1DMipmapLevels : procedure?
gluBuild1DMipmaps : procedure?
gluBuild2DMipmapLevels : procedure?
gluBuild2DMipmaps : procedure?
gluBuild3DMipmapLevels : procedure?
gluBuild3DMipmaps : procedure?
gluCylinder : procedure?
gluDisk : procedure?
gluLookAt : procedure?
gluNewQuadric : procedure?
gluOrtho2D : procedure?
gluPartialDisk : procedure?
gluPerspective : procedure?
gluPickMatrix : procedure?
gluQuadricDrawStyle : procedure?
gluQuadricNormals : procedure?
gluQuadricOrientation : procedure?
gluQuadricTexture : procedure?
gluScaleImage : procedure?
gluSphere : procedure?
```

These functions are all direct translations of the C OpenGL API.

```
GL_FALSE : exact-integer?
GL_TRUE : exact-integer?
GL_BYTE : exact-integer?
GL_UNSIGNED_BYTE : exact-integer?
GL_SHORT : exact-integer?
GL_UNSIGNED_SHORT : exact-integer?
GL_INT : exact-integer?
```

```
GL_UNSIGNED_INT : exact-integer?
GL_FLOAT : exact-integer?
GL_DOUBLE : exact-integer?
GL_2_BYTES : exact-integer?
GL_3_BYTES : exact-integer?
GL_4_BYTES : exact-integer?
GL_POINTS : exact-integer?
GL_LINES : exact-integer?
GL_LINE_LOOP : exact-integer?
GL_LINE_STRIP : exact-integer?
GL_TRIANGLES : exact-integer?
GL_TRIANGLE_STRIP : exact-integer?
GL_TRIANGLE_FAN : exact-integer?
GL_QUADS : exact-integer?
GL_QUAD_STRIP : exact-integer?
GL_POLYGON : exact-integer?
GL_VERTEX_ARRAY : exact-integer?
GL_NORMAL_ARRAY : exact-integer?
GL_COLOR_ARRAY : exact-integer?
GL_INDEX_ARRAY : exact-integer?
GL_TEXTURE_COORD_ARRAY : exact-integer?
GL_EDGE_FLAG_ARRAY : exact-integer?
GL_VERTEX_ARRAY_SIZE : exact-integer?
GL_VERTEX_ARRAY_TYPE : exact-integer?
GL_VERTEX_ARRAY_STRIDE : exact-integer?
GL_NORMAL_ARRAY_TYPE : exact-integer?
GL_NORMAL_ARRAY_STRIDE : exact-integer?
GL_COLOR_ARRAY_SIZE : exact-integer?
GL_COLOR_ARRAY_TYPE : exact-integer?
GL_COLOR_ARRAY_STRIDE : exact-integer?
GL_INDEX_ARRAY_TYPE : exact-integer?
GL_INDEX_ARRAY_STRIDE : exact-integer?
GL_TEXTURE_COORD_ARRAY_SIZE : exact-integer?
GL_TEXTURE_COORD_ARRAY_TYPE : exact-integer?
GL_TEXTURE_COORD_ARRAY_STRIDE : exact-integer?
GL_EDGE_FLAG_ARRAY_STRIDE : exact-integer?
GL_VERTEX_ARRAY_POINTER : exact-integer?
GL_NORMAL_ARRAY_POINTER : exact-integer?
GL_COLOR_ARRAY_POINTER : exact-integer?
GL_INDEX_ARRAY_POINTER : exact-integer?
GL_TEXTURE_COORD_ARRAY_POINTER : exact-integer?
GL_EDGE_FLAG_ARRAY_POINTER : exact-integer?
GL_V2F : exact-integer?
GL_V3F : exact-integer?
GL_C4UB_V2F : exact-integer?
```

```
GL_C4UB_V3F : exact-integer?
GL_C3F_V3F : exact-integer?
GL_N3F_V3F : exact-integer?
GL_C4F_N3F_V3F : exact-integer?
GL_T2F_V3F : exact-integer?
GL_T4F_V4F : exact-integer?
GL_T2F_C4UB_V3F : exact-integer?
GL_T2F_C3F_V3F : exact-integer?
GL_T2F_N3F_V3F : exact-integer?
GL_T2F_C4F_N3F_V3F : exact-integer?
GL_T4F_C4F_N3F_V4F : exact-integer?
GL_MATRIX_MODE : exact-integer?
GL_MODELVIEW : exact-integer?
GL_PROJECTION : exact-integer?
GL_TEXTURE : exact-integer?
GL_POINT_SMOOTH : exact-integer?
GL_POINT_SIZE : exact-integer?
GL_POINT_SIZE_GRANULARITY : exact-integer?
GL_POINT_SIZE_RANGE : exact-integer?
GL_LINE_SMOOTH : exact-integer?
GL_LINE_STIPPLE : exact-integer?
GL_LINE_STIPPLE_PATTERN : exact-integer?
GL_LINE_STIPPLE_REPEAT : exact-integer?
GL_LINE_WIDTH : exact-integer?
GL_LINE_WIDTH_GRANULARITY : exact-integer?
GL_LINE_WIDTH_RANGE : exact-integer?
GL_POINT : exact-integer?
GL_LINE : exact-integer?
GL_FILL : exact-integer?
GL_CW : exact-integer?
GL_CCW : exact-integer?
GL_FRONT : exact-integer?
GL_BACK : exact-integer?
GL_POLYGON_MODE : exact-integer?
GL_POLYGON_SMOOTH : exact-integer?
GL_POLYGON_STIPPLE : exact-integer?
GL_EDGE_FLAG : exact-integer?
GL_CULL_FACE : exact-integer?
GL_CULL_FACE_MODE : exact-integer?
GL_FRONT_FACE : exact-integer?
GL_POLYGON_OFFSET_FACTOR : exact-integer?
GL_POLYGON_OFFSET_UNITS : exact-integer?
GL_POLYGON_OFFSET_POINT : exact-integer?
GL_POLYGON_OFFSET_LINE : exact-integer?
GL_POLYGON_OFFSET_FILL : exact-integer?
```

```
GL_COMPILE : exact-integer?
GL_COMPILE_AND_EXECUTE : exact-integer?
GL_LIST_BASE : exact-integer?
GL_LIST_INDEX : exact-integer?
GL_LIST_MODE : exact-integer?
GL_NEVER : exact-integer?
GL_LESS : exact-integer?
GL_EQUAL : exact-integer?
GL_LEQUAL : exact-integer?
GL_GREATER : exact-integer?
GL_NOTEQUAL : exact-integer?
GL_GEQUAL : exact-integer?
GL_ALWAYS : exact-integer?
GL_DEPTH_TEST : exact-integer?
GL_DEPTH_BITS : exact-integer?
GL_DEPTH_CLEAR_VALUE : exact-integer?
GL_DEPTH_FUNC : exact-integer?
GL_DEPTH_RANGE : exact-integer?
GL_DEPTH_WRITEMASK : exact-integer?
GL_DEPTH_COMPONENT : exact-integer?
GL_LIGHTING : exact-integer?
GL_LIGHT0 : exact-integer?
GL_LIGHT1 : exact-integer?
GL_LIGHT2 : exact-integer?
GL_LIGHT3 : exact-integer?
GL_LIGHT4 : exact-integer?
GL_LIGHT5 : exact-integer?
GL_LIGHT6 : exact-integer?
GL_LIGHT7 : exact-integer?
GL_SPOT_EXPONENT : exact-integer?
GL_SPOT_CUTOFF : exact-integer?
GL_CONSTANT_ATTENUATION : exact-integer?
GL_LINEAR_ATTENUATION : exact-integer?
GL_QUADRATIC_ATTENUATION : exact-integer?
GL_AMBIENT : exact-integer?
GL_DIFFUSE : exact-integer?
GL_SPECULAR : exact-integer?
GL_SHININESS : exact-integer?
GL_EMISSION : exact-integer?
GL_POSITION : exact-integer?
GL_SPOT_DIRECTION : exact-integer?
GL_AMBIENT_AND_DIFFUSE : exact-integer?
GL_COLOR_INDEXES : exact-integer?
GL_LIGHT_MODEL_TWO_SIDE : exact-integer?
GL_LIGHT_MODEL_LOCAL_VIEWER : exact-integer?
```

```
GL_LIGHT_MODEL_AMBIENT : exact-integer?
GL_FRONT_AND_BACK : exact-integer?
GL_SHADE_MODEL : exact-integer?
GL_FLAT : exact-integer?
GL_SMOOTH : exact-integer?
GL_COLOR_MATERIAL : exact-integer?
GL_COLOR_MATERIAL_FACE : exact-integer?
GL_COLOR_MATERIAL_PARAMETER : exact-integer?
GL_NORMALIZE : exact-integer?
GL_CLIP_PLANE0 : exact-integer?
GL_CLIP_PLANE1 : exact-integer?
GL_CLIP_PLANE2 : exact-integer?
GL_CLIP_PLANE3 : exact-integer?
GL_CLIP_PLANE4 : exact-integer?
GL_CLIP_PLANE5 : exact-integer?
GL_ACCUM_RED_BITS : exact-integer?
GL_ACCUM_GREEN_BITS : exact-integer?
GL_ACCUM_BLUE_BITS : exact-integer?
GL_ACCUM_ALPHA_BITS : exact-integer?
GL_ACCUM_CLEAR_VALUE : exact-integer?
GL_ACCUM : exact-integer?
GL_ADD : exact-integer?
GL_LOAD : exact-integer?
GL_MULT : exact-integer?
GL_RETURN : exact-integer?
GL_ALPHA_TEST : exact-integer?
GL_ALPHA_TEST_REF : exact-integer?
GL_ALPHA_TEST_FUNC : exact-integer?
GL_BLEND : exact-integer?
GL_BLEND_SRC : exact-integer?
GL_BLEND_DST : exact-integer?
GL_ZERO : exact-integer?
GL_ONE : exact-integer?
GL_SRC_COLOR : exact-integer?
GL_ONE_MINUS_SRC_COLOR : exact-integer?
GL_SRC_ALPHA : exact-integer?
GL_ONE_MINUS_SRC_ALPHA : exact-integer?
GL_DST_ALPHA : exact-integer?
GL_ONE_MINUS_DST_ALPHA : exact-integer?
GL_DST_COLOR : exact-integer?
GL_ONE_MINUS_DST_COLOR : exact-integer?
GL_SRC_ALPHA_SATURATE : exact-integer?
GL_FEEDBACK : exact-integer?
GL_RENDER : exact-integer?
GL_SELECT : exact-integer?
```

```
GL_2D : exact-integer?
GL_3D : exact-integer?
GL_3D_COLOR : exact-integer?
GL_3D_COLOR_TEXTURE : exact-integer?
GL_4D_COLOR_TEXTURE : exact-integer?
GL_POINT_TOKEN : exact-integer?
GL_LINE_TOKEN : exact-integer?
GL_LINE_RESET_TOKEN : exact-integer?
GL_POLYGON_TOKEN : exact-integer?
GL_BITMAP_TOKEN : exact-integer?
GL_DRAW_PIXEL_TOKEN : exact-integer?
GL_COPY_PIXEL_TOKEN : exact-integer?
GL_PASS_THROUGH_TOKEN : exact-integer?
GL_FEEDBACK_BUFFER_POINTER : exact-integer?
GL_FEEDBACK_BUFFER_SIZE : exact-integer?
GL_FEEDBACK_BUFFER_TYPE : exact-integer?
GL_SELECTION_BUFFER_POINTER : exact-integer?
GL_SELECTION_BUFFER_SIZE : exact-integer?
GL_FOG : exact-integer?
GL_FOG_MODE : exact-integer?
GL_FOG_DENSITY : exact-integer?
GL_FOG_COLOR : exact-integer?
GL_FOG_INDEX : exact-integer?
GL_FOG_START : exact-integer?
GL_FOG_END : exact-integer?
GL_LINEAR : exact-integer?
GL_EXP : exact-integer?
GL_EXP2 : exact-integer?
GL_LOGIC_OP : exact-integer?
GL_INDEX_LOGIC_OP : exact-integer?
GL_COLOR_LOGIC_OP : exact-integer?
GL_LOGIC_OP_MODE : exact-integer?
GL_CLEAR : exact-integer?
GL_SET : exact-integer?
GL_COPY : exact-integer?
GL_COPY_INVERTED : exact-integer?
GL_NOOP : exact-integer?
GL_INVERT : exact-integer?
GL_AND : exact-integer?
GL_NAND : exact-integer?
GL_OR : exact-integer?
GL_NOR : exact-integer?
GL_XOR : exact-integer?
GL_EQUIV : exact-integer?
GL_AND_REVERSE : exact-integer?
```

```
GL_AND_INVERTED : exact-integer?
GL_OR_REVERSE : exact-integer?
GL_OR_INVERTED : exact-integer?
GL_STENCIL_TEST : exact-integer?
GL_STENCIL_WRITEMASK : exact-integer?
GL_STENCIL_BITS : exact-integer?
GL_STENCIL_FUNC : exact-integer?
GL_STENCIL_VALUE_MASK : exact-integer?
GL_STENCIL_REF : exact-integer?
GL_STENCIL_FAIL : exact-integer?
GL_STENCIL_PASS_DEPTH_PASS : exact-integer?
GL_STENCIL_PASS_DEPTH_FAIL : exact-integer?
GL_STENCIL_CLEAR_VALUE : exact-integer?
GL_STENCIL_INDEX : exact-integer?
GL_KEEP : exact-integer?
GL_REPLACE : exact-integer?
GL_INCR : exact-integer?
GL_DECR : exact-integer?
GL_NONE : exact-integer?
GL_LEFT : exact-integer?
GL_RIGHT : exact-integer?
GL_FRONT_LEFT : exact-integer?
GL_FRONT_RIGHT : exact-integer?
GL_BACK_LEFT : exact-integer?
GL_BACK_RIGHT : exact-integer?
GL_AUX0 : exact-integer?
GL_AUX1 : exact-integer?
GL_AUX2 : exact-integer?
GL_AUX3 : exact-integer?
GL_COLOR_INDEX : exact-integer?
GL_RED : exact-integer?
GL_GREEN : exact-integer?
GL_BLUE : exact-integer?
GL_ALPHA : exact-integer?
GL_LUMINANCE : exact-integer?
GL_LUMINANCE_ALPHA : exact-integer?
GL_ALPHA_BITS : exact-integer?
GL_RED_BITS : exact-integer?
GL_GREEN_BITS : exact-integer?
GL_BLUE_BITS : exact-integer?
GL_INDEX_BITS : exact-integer?
GL_SUBPIXEL_BITS : exact-integer?
GL_AUX_BUFFERS : exact-integer?
GL_READ_BUFFER : exact-integer?
GL_DRAW_BUFFER : exact-integer?
```

```
GL_DOUBLEBUFFER : exact-integer?
GL_STEREO : exact-integer?
GL_BITMAP : exact-integer?
GL_COLOR : exact-integer?
GL_DEPTH : exact-integer?
GL_STENCIL : exact-integer?
GL_DITHER : exact-integer?
GL_RGB : exact-integer?
GL_RGBA : exact-integer?
GL_MAX_LIST_NESTING : exact-integer?
GL_MAX_ATTRIB_STACK_DEPTH : exact-integer?
GL_MAX_MODELVIEW_STACK_DEPTH : exact-integer?
GL_MAX_NAME_STACK_DEPTH : exact-integer?
GL_MAX_PROJECTION_STACK_DEPTH : exact-integer?
GL_MAX_TEXTURE_STACK_DEPTH : exact-integer?
GL_MAX_EVAL_ORDER : exact-integer?
GL_MAX_LIGHTS : exact-integer?
GL_MAX_CLIP_PLANES : exact-integer?
GL_MAX_TEXTURE_SIZE : exact-integer?
GL_MAX_PIXEL_MAP_TABLE : exact-integer?
GL_MAX_VIEWPORT_DIMS : exact-integer?
GL_MAX_CLIENT_ATTRIB_STACK_DEPTH : exact-integer?
GL_ATTRIB_STACK_DEPTH : exact-integer?
GL_CLIENT_ATTRIB_STACK_DEPTH : exact-integer?
GL_COLOR_CLEAR_VALUE : exact-integer?
GL_COLOR_WRITEMASK : exact-integer?
GL_CURRENT_INDEX : exact-integer?
GL_CURRENT_COLOR : exact-integer?
GL_CURRENT_NORMAL : exact-integer?
GL_CURRENT_RASTER_COLOR : exact-integer?
GL_CURRENT_RASTER_DISTANCE : exact-integer?
GL_CURRENT_RASTER_INDEX : exact-integer?
GL_CURRENT_RASTER_POSITION : exact-integer?
GL_CURRENT_RASTER_TEXTURE_COORDS : exact-integer?
GL_CURRENT_RASTER_POSITION_VALID : exact-integer?
GL_CURRENT_TEXTURE_COORDS : exact-integer?
GL_INDEX_CLEAR_VALUE : exact-integer?
GL_INDEX_MODE : exact-integer?
GL_INDEX_WRITEMASK : exact-integer?
GL_MODELVIEW_MATRIX : exact-integer?
GL_MODELVIEW_STACK_DEPTH : exact-integer?
GL_NAME_STACK_DEPTH : exact-integer?
GL_PROJECTION_MATRIX : exact-integer?
GL_PROJECTION_STACK_DEPTH : exact-integer?
GL_RENDER_MODE : exact-integer?
```

```
GL_RGBA_MODE : exact-integer?
GL_TEXTURE_MATRIX : exact-integer?
GL_TEXTURE_STACK_DEPTH : exact-integer?
GL_VIEWPORT : exact-integer?
GL_AUTO_NORMAL : exact-integer?
GL_MAP1_COLOR_4 : exact-integer?
GL_MAP1_GRID_DOMAIN : exact-integer?
GL_MAP1_GRID_SEGMENTS : exact-integer?
GL_MAP1_INDEX : exact-integer?
GL_MAP1_NORMAL : exact-integer?
GL_MAP1_TEXTURE_COORD_1 : exact-integer?
GL_MAP1_TEXTURE_COORD_2 : exact-integer?
GL_MAP1_TEXTURE_COORD_3 : exact-integer?
GL_MAP1_TEXTURE_COORD_4 : exact-integer?
GL_MAP1_VERTEX_3 : exact-integer?
GL_MAP1_VERTEX_4 : exact-integer?
GL_MAP2_COLOR_4 : exact-integer?
GL_MAP2_GRID_DOMAIN : exact-integer?
GL_MAP2_GRID_SEGMENTS : exact-integer?
GL_MAP2_INDEX : exact-integer?
GL_MAP2_NORMAL : exact-integer?
GL_MAP2_TEXTURE_COORD_1 : exact-integer?
GL_MAP2_TEXTURE_COORD_2 : exact-integer?
GL_MAP2_TEXTURE_COORD_3 : exact-integer?
GL_MAP2_TEXTURE_COORD_4 : exact-integer?
GL_MAP2_VERTEX_3 : exact-integer?
GL_MAP2_VERTEX_4 : exact-integer?
GL_COEFF : exact-integer?
GL_DOMAIN : exact-integer?
GL_ORDER : exact-integer?
GL_FOG_HINT : exact-integer?
GL_LINE_SMOOTH_HINT : exact-integer?
GL_PERSPECTIVE_CORRECTION_HINT : exact-integer?
GL_POINT_SMOOTH_HINT : exact-integer?
GL_POLYGON_SMOOTH_HINT : exact-integer?
GL_DONT_CARE : exact-integer?
GL_FASTEST : exact-integer?
GL_NICEST : exact-integer?
GL_SCISSOR_TEST : exact-integer?
GL_SCISSOR_BOX : exact-integer?
GL_MAP_COLOR : exact-integer?
GL_MAP_STENCIL : exact-integer?
GL_INDEX_SHIFT : exact-integer?
GL_INDEX_OFFSET : exact-integer?
GL_RED_SCALE : exact-integer?
```

```
GL_RED_BIAS : exact-integer?
GL_GREEN_SCALE : exact-integer?
GL_GREEN_BIAS : exact-integer?
GL_BLUE_SCALE : exact-integer?
GL_BLUE_BIAS : exact-integer?
GL_ALPHA_SCALE : exact-integer?
GL_ALPHA_BIAS : exact-integer?
GL_DEPTH_SCALE : exact-integer?
GL_DEPTH_BIAS : exact-integer?
GL_PIXEL_MAP_S_TO_S_SIZE : exact-integer?
GL_PIXEL_MAP_I_TO_I_SIZE : exact-integer?
GL_PIXEL_MAP_I_TO_R_SIZE : exact-integer?
GL_PIXEL_MAP_I_TO_G_SIZE : exact-integer?
GL_PIXEL_MAP_I_TO_B_SIZE : exact-integer?
GL_PIXEL_MAP_I_TO_A_SIZE : exact-integer?
GL_PIXEL_MAP_R_TO_R_SIZE : exact-integer?
GL_PIXEL_MAP_G_TO_G_SIZE : exact-integer?
GL_PIXEL_MAP_B_TO_B_SIZE : exact-integer?
GL_PIXEL_MAP_A_TO_A_SIZE : exact-integer?
GL_PIXEL_MAP_S_TO_S : exact-integer?
GL_PIXEL_MAP_I_TO_I : exact-integer?
GL_PIXEL_MAP_I_TO_R : exact-integer?
GL_PIXEL_MAP_I_TO_G : exact-integer?
GL_PIXEL_MAP_I_TO_B : exact-integer?
GL_PIXEL_MAP_I_TO_A : exact-integer?
GL_PIXEL_MAP_R_TO_R : exact-integer?
GL_PIXEL_MAP_G_TO_G : exact-integer?
GL_PIXEL_MAP_B_TO_B : exact-integer?
GL_PIXEL_MAP_A_TO_A : exact-integer?
GL_PACK_ALIGNMENT : exact-integer?
GL_PACK_LSB_FIRST : exact-integer?
GL_PACK_ROW_LENGTH : exact-integer?
GL_PACK_SKIP_PIXELS : exact-integer?
GL_PACK_SKIP_ROWS : exact-integer?
GL_PACK_SWAP_BYTES : exact-integer?
GL_UNPACK_ALIGNMENT : exact-integer?
GL_UNPACK_LSB_FIRST : exact-integer?
GL_UNPACK_ROW_LENGTH : exact-integer?
GL_UNPACK_SKIP_PIXELS : exact-integer?
GL_UNPACK_SKIP_ROWS : exact-integer?
GL_UNPACK_SWAP_BYTES : exact-integer?
GL_ZOOM_X : exact-integer?
GL_ZOOM_Y : exact-integer?
GL_TEXTURE_ENV : exact-integer?
GL_TEXTURE_ENV_MODE : exact-integer?
```

```
GL_TEXTURE_1D : exact-integer?
GL_TEXTURE_2D : exact-integer?
GL_TEXTURE_WRAP_S : exact-integer?
GL_TEXTURE_WRAP_T : exact-integer?
GL_TEXTURE_MAG_FILTER : exact-integer?
GL_TEXTURE_MIN_FILTER : exact-integer?
GL_TEXTURE_ENV_COLOR : exact-integer?
GL_TEXTURE_GEN_S : exact-integer?
GL_TEXTURE_GEN_T : exact-integer?
GL_TEXTURE_GEN_MODE : exact-integer?
GL_TEXTURE_BORDER_COLOR : exact-integer?
GL_TEXTURE_WIDTH : exact-integer?
GL_TEXTURE_HEIGHT : exact-integer?
GL_TEXTURE_BORDER : exact-integer?
GL_TEXTURE_COMPONENTS : exact-integer?
GL_TEXTURE_RED_SIZE : exact-integer?
GL_TEXTURE_GREEN_SIZE : exact-integer?
GL_TEXTURE_BLUE_SIZE : exact-integer?
GL_TEXTURE_ALPHA_SIZE : exact-integer?
GL_TEXTURE_LUMINANCE_SIZE : exact-integer?
GL_TEXTURE_INTENSITY_SIZE : exact-integer?
GL_NEAREST_MIPMAP_NEAREST : exact-integer?
GL_NEAREST_MIPMAP_LINEAR : exact-integer?
GL_LINEAR_MIPMAP_NEAREST : exact-integer?
GL_LINEAR_MIPMAP_LINEAR : exact-integer?
GL_OBJECT_LINEAR : exact-integer?
GL_OBJECT_PLANE : exact-integer?
GL_EYE_LINEAR : exact-integer?
GL_EYE_PLANE : exact-integer?
GL_SPHERE_MAP : exact-integer?
GL_DECAL : exact-integer?
GL_MODULATE : exact-integer?
GL_NEAREST : exact-integer?
GL_REPEAT : exact-integer?
GL_CLAMP : exact-integer?
GL_S : exact-integer?
GL_T : exact-integer?
GL_R : exact-integer?
GL_Q : exact-integer?
GL_TEXTURE_GEN_R : exact-integer?
GL_TEXTURE_GEN_Q : exact-integer?
GL_VENDOR : exact-integer?
GL_RENDERER : exact-integer?
GL_VERSION : exact-integer?
GL_EXTENSIONS : exact-integer?
```

```
GL_NO_ERROR : exact-integer?
GL_INVALID_VALUE : exact-integer?
GL_INVALID_ENUM : exact-integer?
GL_INVALID_OPERATION : exact-integer?
GL_STACK_OVERFLOW : exact-integer?
GL_STACK_UNDERFLOW : exact-integer?
GL_OUT_OF_MEMORY : exact-integer?
GL_CURRENT_BIT : exact-integer?
GL_POINT_BIT : exact-integer?
GL_LINE_BIT : exact-integer?
GL_POLYGON_BIT : exact-integer?
GL_POLYGON_STIPPLE_BIT : exact-integer?
GL_PIXEL_MODE_BIT : exact-integer?
GL_LIGHTING_BIT : exact-integer?
GL_FOG_BIT : exact-integer?
GL_DEPTH_BUFFER_BIT : exact-integer?
GL_ACCUM_BUFFER_BIT : exact-integer?
GL_STENCIL_BUFFER_BIT : exact-integer?
GL_VIEWPORT_BIT : exact-integer?
GL_TRANSFORM_BIT : exact-integer?
GL_ENABLE_BIT : exact-integer?
GL_COLOR_BUFFER_BIT : exact-integer?
GL_HINT_BIT : exact-integer?
GL_EVAL_BIT : exact-integer?
GL_LIST_BIT : exact-integer?
GL_TEXTURE_BIT : exact-integer?
GL_SCISSOR_BIT : exact-integer?
GL_ALL_ATTRIB_BITS : exact-integer?
GL_PROXY_TEXTURE_1D : exact-integer?
GL_PROXY_TEXTURE_2D : exact-integer?
GL_TEXTURE_PRIORITY : exact-integer?
GL_TEXTURE_RESIDENT : exact-integer?
GL_TEXTURE_BINDING_1D : exact-integer?
GL_TEXTURE_BINDING_2D : exact-integer?
GL_TEXTURE_INTERNAL_FORMAT : exact-integer?
GL_ALPHA4 : exact-integer?
GL_ALPHA8 : exact-integer?
GL_ALPHA12 : exact-integer?
GL_ALPHA16 : exact-integer?
GL_LUMINANCE4 : exact-integer?
GL_LUMINANCE8 : exact-integer?
GL_LUMINANCE12 : exact-integer?
GL_LUMINANCE16 : exact-integer?
GL_LUMINANCE4_ALPHA4 : exact-integer?
GL_LUMINANCE6_ALPHA2 : exact-integer?
```

```
GL_LUMINANCE8_ALPHA8 : exact-integer?
GL_LUMINANCE12_ALPHA4 : exact-integer?
GL_LUMINANCE12_ALPHA12 : exact-integer?
GL_LUMINANCE16_ALPHA16 : exact-integer?
GL_INTENSITY : exact-integer?
GL_INTENSITY4 : exact-integer?
GL_INTENSITY8 : exact-integer?
GL_INTENSITY12 : exact-integer?
GL_INTENSITY16 : exact-integer?
GL_R3_G3_B2 : exact-integer?
GL_RGB4 : exact-integer?
GL_RGB5 : exact-integer?
GL_RGB8 : exact-integer?
GL_RGB10 : exact-integer?
GL_RGB12 : exact-integer?
GL_RGB16 : exact-integer?
GL_RGBA2 : exact-integer?
GL_RGBA4 : exact-integer?
GL_RGB5_A1 : exact-integer?
GL_RGBA8 : exact-integer?
GL_RGB10_A2 : exact-integer?
GL_RGBA12 : exact-integer?
GL_RGBA16 : exact-integer?
GL_CLIENT_PIXEL_STORE_BIT : exact-integer?
GL_CLIENT_VERTEX_ARRAY_BIT : exact-integer?
GL_ALL_CLIENT_ATTRIB_BITS : exact-integer?
GL_CLIENT_ALL_ATTRIB_BITS : exact-integer?
GL_UNSIGNED_BYTE_3_3_2 : exact-integer?
GL_UNSIGNED_SHORT_4_4_4_4 : exact-integer?
GL_UNSIGNED_SHORT_5_5_5_1 : exact-integer?
GL_UNSIGNED_INT_8_8_8_8 : exact-integer?
GL_UNSIGNED_INT_10_10_10_2 : exact-integer?
GL_RESCALE_NORMAL : exact-integer?
GL_TEXTURE_BINDING_3D : exact-integer?
GL_PACK_SKIP_IMAGES : exact-integer?
GL_PACK_IMAGE_HEIGHT : exact-integer?
GL_UNPACK_SKIP_IMAGES : exact-integer?
GL_UNPACK_IMAGE_HEIGHT : exact-integer?
GL_TEXTURE_3D : exact-integer?
GL_PROXY_TEXTURE_3D : exact-integer?
GL_TEXTURE_DEPTH : exact-integer?
GL_TEXTURE_WRAP_R : exact-integer?
GL_MAX_3D_TEXTURE_SIZE : exact-integer?
GL_UNSIGNED_BYTE_2_3_3_REV : exact-integer?
GL_UNSIGNED_SHORT_5_6_5 : exact-integer?
```

```
GL_UNSIGNED_SHORT_5_6_5_REV : exact-integer?
GL_UNSIGNED_SHORT_4_4_4_4_REV : exact-integer?
GL_UNSIGNED_SHORT_1_5_5_5_REV : exact-integer?
GL_UNSIGNED_INT_8_8_8_8_REV : exact-integer?
GL_UNSIGNED_INT_2_10_10_10_REV : exact-integer?
GL_BGR : exact-integer?
GL_BGRA : exact-integer?
GL_MAX_ELEMENTS_VERTICES : exact-integer?
GL_MAX_ELEMENTS_INDICES : exact-integer?
GL_CLAMP_TO_EDGE : exact-integer?
GL_TEXTURE_MIN_LOD : exact-integer?
GL_TEXTURE_MAX_LOD : exact-integer?
GL_TEXTURE_BASE_LEVEL : exact-integer?
GL_TEXTURE_MAX_LEVEL : exact-integer?
GL_LIGHT_MODEL_COLOR_CONTROL : exact-integer?
GL_SINGLE_COLOR : exact-integer?
GL_SEPARATE_SPECULAR_COLOR : exact-integer?
GL_SMOOTH_POINT_SIZE_RANGE : exact-integer?
GL_SMOOTH_POINT_SIZE_GRANULARITY : exact-integer?
GL_SMOOTH_LINE_WIDTH_RANGE : exact-integer?
GL_SMOOTH_LINE_WIDTH_GRANULARITY : exact-integer?
GL_ALIASED_POINT_SIZE_RANGE : exact-integer?
GL_ALIASED_LINE_WIDTH_RANGE : exact-integer?
GL_CONSTANT_COLOR : exact-integer?
GL_ONE_MINUS_CONSTANT_COLOR : exact-integer?
GL_CONSTANT_ALPHA : exact-integer?
GL_ONE_MINUS_CONSTANT_ALPHA : exact-integer?
GL_BLEND_COLOR : exact-integer?
GL_FUNC_ADD : exact-integer?
GL_MIN : exact-integer?
GL_MAX : exact-integer?
GL_BLEND_EQUATION : exact-integer?
GL_FUNC_SUBTRACT : exact-integer?
GL_FUNC_REVERSE_SUBTRACT : exact-integer?
GL_CONVOLUTION_1D : exact-integer?
GL_CONVOLUTION_2D : exact-integer?
GL_SEPARABLE_2D : exact-integer?
GL_CONVOLUTION_BORDER_MODE : exact-integer?
GL_CONVOLUTION_FILTER_SCALE : exact-integer?
GL_CONVOLUTION_FILTER_BIAS : exact-integer?
GL_REDUCE : exact-integer?
GL_CONVOLUTION_FORMAT : exact-integer?
GL_CONVOLUTION_WIDTH : exact-integer?
GL_CONVOLUTION_HEIGHT : exact-integer?
GL_MAX_CONVOLUTION_WIDTH : exact-integer?
```

```
GL_MAX_CONVOLUTION_HEIGHT : exact-integer?
GL_POST_CONVOLUTION_RED_SCALE : exact-integer?
GL_POST_CONVOLUTION_GREEN_SCALE : exact-integer?
GL_POST_CONVOLUTION_BLUE_SCALE : exact-integer?
GL_POST_CONVOLUTION_ALPHA_SCALE : exact-integer?
GL_POST_CONVOLUTION_RED_BIAS : exact-integer?
GL_POST_CONVOLUTION_GREEN_BIAS : exact-integer?
GL_POST_CONVOLUTION_BLUE_BIAS : exact-integer?
GL_POST_CONVOLUTION_ALPHA_BIAS : exact-integer?
GL_HISTOGRAM : exact-integer?
GL_PROXY_HISTOGRAM : exact-integer?
GL_HISTOGRAM_WIDTH : exact-integer?
GL_HISTOGRAM_FORMAT : exact-integer?
GL_HISTOGRAM_RED_SIZE : exact-integer?
GL_HISTOGRAM_GREEN_SIZE : exact-integer?
GL_HISTOGRAM_BLUE_SIZE : exact-integer?
GL_HISTOGRAM_ALPHA_SIZE : exact-integer?
GL_HISTOGRAM_LUMINANCE_SIZE : exact-integer?
GL_HISTOGRAM_SINK : exact-integer?
GL_MINMAX : exact-integer?
GL_MINMAX_FORMAT : exact-integer?
GL_MINMAX_SINK : exact-integer?
GL_TABLE_TOO_LARGE : exact-integer?
GL_COLOR_MATRIX : exact-integer?
GL_COLOR_MATRIX_STACK_DEPTH : exact-integer?
GL_MAX_COLOR_MATRIX_STACK_DEPTH : exact-integer?
GL_POST_COLOR_MATRIX_RED_SCALE : exact-integer?
GL_POST_COLOR_MATRIX_GREEN_SCALE : exact-integer?
GL_POST_COLOR_MATRIX_BLUE_SCALE : exact-integer?
GL_POST_COLOR_MATRIX_ALPHA_SCALE : exact-integer?
GL_POST_COLOR_MATRIX_RED_BIAS : exact-integer?
GL_POST_COLOR_MATRIX_GREEN_BIAS : exact-integer?
GL_POST_COLOR_MATRIX_BLUE_BIAS : exact-integer?
GL_POST_COLOR_MATRIX_ALPHA_BIAS : exact-integer?
GL_COLOR_TABLE : exact-integer?
GL_POST_CONVOLUTION_COLOR_TABLE : exact-integer?
GL_POST_COLOR_MATRIX_COLOR_TABLE : exact-integer?
GL_PROXY_COLOR_TABLE : exact-integer?
GL_PROXY_POST_CONVOLUTION_COLOR_TABLE : exact-integer?
GL_PROXY_POST_COLOR_MATRIX_COLOR_TABLE : exact-integer?
GL_COLOR_TABLE_SCALE : exact-integer?
GL_COLOR_TABLE_BIAS : exact-integer?
GL_COLOR_TABLE_FORMAT : exact-integer?
GL_COLOR_TABLE_WIDTH : exact-integer?
GL_COLOR_TABLE_RED_SIZE : exact-integer?
```

```
GL_COLOR_TABLE_GREEN_SIZE : exact-integer?
GL_COLOR_TABLE_BLUE_SIZE : exact-integer?
GL_COLOR_TABLE_ALPHA_SIZE : exact-integer?
GL_COLOR_TABLE_LUMINANCE_SIZE : exact-integer?
GL_COLOR_TABLE_INTENSITY_SIZE : exact-integer?
GL_CONSTANT_BORDER : exact-integer?
GL_REPLICATE_BORDER : exact-integer?
GL_CONVOLUTION_BORDER_COLOR : exact-integer?
GL_TEXTURE0 : exact-integer?
GL_TEXTURE1 : exact-integer?
GL_TEXTURE2 : exact-integer?
GL_TEXTURE3 : exact-integer?
GL_TEXTURE4 : exact-integer?
GL_TEXTURE5 : exact-integer?
GL_TEXTURE6 : exact-integer?
GL_TEXTURE7 : exact-integer?
GL_TEXTURE8 : exact-integer?
GL_TEXTURE9 : exact-integer?
GL_TEXTURE10 : exact-integer?
GL_TEXTURE11 : exact-integer?
GL_TEXTURE12 : exact-integer?
GL_TEXTURE13 : exact-integer?
GL_TEXTURE14 : exact-integer?
GL_TEXTURE15 : exact-integer?
GL_TEXTURE16 : exact-integer?
GL_TEXTURE17 : exact-integer?
GL_TEXTURE18 : exact-integer?
GL_TEXTURE19 : exact-integer?
GL_TEXTURE20 : exact-integer?
GL_TEXTURE21 : exact-integer?
GL_TEXTURE22 : exact-integer?
GL_TEXTURE23 : exact-integer?
GL_TEXTURE24 : exact-integer?
GL_TEXTURE25 : exact-integer?
GL_TEXTURE26 : exact-integer?
GL_TEXTURE27 : exact-integer?
GL_TEXTURE28 : exact-integer?
GL_TEXTURE29 : exact-integer?
GL_TEXTURE30 : exact-integer?
GL_TEXTURE31 : exact-integer?
GL_ACTIVE_TEXTURE : exact-integer?
GL_CLIENT_ACTIVE_TEXTURE : exact-integer?
GL_MAX_TEXTURE_UNITS : exact-integer?
GL_TRANSPOSE_MODELVIEW_MATRIX : exact-integer?
GL_TRANSPOSE_PROJECTION_MATRIX : exact-integer?
```

```
GL_TRANSPOSE_TEXTURE_MATRIX : exact-integer?
GL_TRANSPOSE_COLOR_MATRIX : exact-integer?
GL_MULTISAMPLE : exact-integer?
GL_SAMPLE_ALPHA_TO_COVERAGE : exact-integer?
GL_SAMPLE_ALPHA_TO_ONE : exact-integer?
GL_SAMPLE_COVERAGE : exact-integer?
GL_SAMPLE_BUFFERS : exact-integer?
GL_SAMPLES : exact-integer?
GL_SAMPLE_COVERAGE_VALUE : exact-integer?
GL_SAMPLE_COVERAGE_INVERT : exact-integer?
GL_MULTISAMPLE_BIT : exact-integer?
GL_NORMAL_MAP : exact-integer?
GL_REFLECTION_MAP : exact-integer?
GL_TEXTURE_CUBE_MAP : exact-integer?
GL_TEXTURE_BINDING_CUBE_MAP : exact-integer?
GL_TEXTURE_CUBE_MAP_POSITIVE_X : exact-integer?
GL_TEXTURE_CUBE_MAP_NEGATIVE_X : exact-integer?
GL_TEXTURE_CUBE_MAP_POSITIVE_Y : exact-integer?
GL_TEXTURE_CUBE_MAP_NEGATIVE_Y : exact-integer?
GL_TEXTURE_CUBE_MAP_POSITIVE_Z : exact-integer?
GL_TEXTURE_CUBE_MAP_NEGATIVE_Z : exact-integer?
GL_PROXY_TEXTURE_CUBE_MAP : exact-integer?
GL_MAX_CUBE_MAP_TEXTURE_SIZE : exact-integer?
GL_COMPRESSED_ALPHA : exact-integer?
GL_COMPRESSED_LUMINANCE : exact-integer?
GL_COMPRESSED_LUMINANCE_ALPHA : exact-integer?
GL_COMPRESSED_INTENSITY : exact-integer?
GL_COMPRESSED_RGB : exact-integer?
GL_COMPRESSED_RGBA : exact-integer?
GL_TEXTURE_COMPRESSION_HINT : exact-integer?
GL_TEXTURE_COMPRESSED_IMAGE_SIZE : exact-integer?
GL_TEXTURE_COMPRESSED : exact-integer?
GL_NUM_COMPRESSED_TEXTURE_FORMATS : exact-integer?
GL_COMPRESSED_TEXTURE_FORMATS : exact-integer?
GL_CLAMP_TO_BORDER : exact-integer?
GL_COMBINE : exact-integer?
GL_COMBINE_RGB : exact-integer?
GL_COMBINE_ALPHA : exact-integer?
GL_SOURCE0_RGB : exact-integer?
GL_SOURCE1_RGB : exact-integer?
GL_SOURCE2_RGB : exact-integer?
GL_SOURCE0_ALPHA : exact-integer?
GL_SOURCE1_ALPHA : exact-integer?
GL_SOURCE2_ALPHA : exact-integer?
GL_OPERAND0_RGB : exact-integer?
```

```
GL_OPERAND1_RGB : exact-integer?
GL_OPERAND2_RGB : exact-integer?
GL_OPERAND0_ALPHA : exact-integer?
GL_OPERAND1_ALPHA : exact-integer?
GL_OPERAND2_ALPHA : exact-integer?
GL_RGB_SCALE : exact-integer?
GL_ADD_SIGNED : exact-integer?
GL_INTERPOLATE : exact-integer?
GL_SUBTRACT : exact-integer?
GL_CONSTANT : exact-integer?
GL_PRIMARY_COLOR : exact-integer?
GL_PREVIOUS : exact-integer?
GL_DOT3_RGB : exact-integer?
GL_DOT3_RGBA : exact-integer?
GL_BLEND_DST_RGB : exact-integer?
GL_BLEND_SRC_RGB : exact-integer?
GL_BLEND_DST_ALPHA : exact-integer?
GL_BLEND_SRC_ALPHA : exact-integer?
GL_POINT_SIZE_MIN : exact-integer?
GL_POINT_SIZE_MAX : exact-integer?
GL_POINT_FADE_THRESHOLD_SIZE : exact-integer?
GL_POINT_DISTANCE_ATTENUATION : exact-integer?
GL_GENERATE_MIPMAP : exact-integer?
GL_GENERATE_MIPMAP_HINT : exact-integer?
GL_DEPTH_COMPONENT16 : exact-integer?
GL_DEPTH_COMPONENT24 : exact-integer?
GL_DEPTH_COMPONENT32 : exact-integer?
GL_MIRRORED_REPEAT : exact-integer?
GL_FOG_COORDINATE_SOURCE : exact-integer?
GL_FOG_COORDINATE : exact-integer?
GL_FRAGMENT_DEPTH : exact-integer?
GL_CURRENT_FOG_COORDINATE : exact-integer?
GL_FOG_COORDINATE_ARRAY_TYPE : exact-integer?
GL_FOG_COORDINATE_ARRAY_STRIDE : exact-integer?
GL_FOG_COORDINATE_ARRAY_POINTER : exact-integer?
GL_FOG_COORDINATE_ARRAY : exact-integer?
GL_COLOR_SUM : exact-integer?
GL_CURRENT_SECONDARY_COLOR : exact-integer?
GL_SECONDARY_COLOR_ARRAY_SIZE : exact-integer?
GL_SECONDARY_COLOR_ARRAY_TYPE : exact-integer?
GL_SECONDARY_COLOR_ARRAY_STRIDE : exact-integer?
GL_SECONDARY_COLOR_ARRAY_POINTER : exact-integer?
GL_SECONDARY_COLOR_ARRAY : exact-integer?
GL_MAX_TEXTURE_LOD_BIAS : exact-integer?
GL_TEXTURE_FILTER_CONTROL : exact-integer?
```

```
GL_TEXTURE_LOD_BIAS : exact-integer?
GL_INCR_WRAP : exact-integer?
GL_DECR_WRAP : exact-integer?
GL_TEXTURE_DEPTH_SIZE : exact-integer?
GL_DEPTH_TEXTURE_MODE : exact-integer?
GL_TEXTURE_COMPARE_MODE : exact-integer?
GL_TEXTURE_COMPARE_FUNC : exact-integer?
GL_COMPARE_R_TO_TEXTURE : exact-integer?
GL_BUFFER_SIZE : exact-integer?
GL_BUFFER_USAGE : exact-integer?
GL_QUERY_COUNTER_BITS : exact-integer?
GL_CURRENT_QUERY : exact-integer?
GL_QUERY_RESULT : exact-integer?
GL_QUERY_RESULT_AVAILABLE : exact-integer?
GL_ARRAY_BUFFER : exact-integer?
GL_ELEMENT_ARRAY_BUFFER : exact-integer?
GL_ARRAY_BUFFER_BINDING : exact-integer?
GL_ELEMENT_ARRAY_BUFFER_BINDING : exact-integer?
GL_VERTEX_ARRAY_BUFFER_BINDING : exact-integer?
GL_NORMAL_ARRAY_BUFFER_BINDING : exact-integer?
GL_COLOR_ARRAY_BUFFER_BINDING : exact-integer?
GL_INDEX_ARRAY_BUFFER_BINDING : exact-integer?
GL_TEXTURE_COORD_ARRAY_BUFFER_BINDING : exact-integer?
GL_EDGE_FLAG_ARRAY_BUFFER_BINDING : exact-integer?
GL_SECONDARY_COLOR_ARRAY_BUFFER_BINDING : exact-integer?
GL_FOG_COORDINATE_ARRAY_BUFFER_BINDING : exact-integer?
GL_WEIGHT_ARRAY_BUFFER_BINDING : exact-integer?
GL_VERTEX_ATTRIB_ARRAY_BUFFER_BINDING : exact-integer?
GL_READ_ONLY : exact-integer?
GL_WRITE_ONLY : exact-integer?
GL_READ_WRITE : exact-integer?
GL_BUFFER_ACCESS : exact-integer?
GL_BUFFER_MAPPED : exact-integer?
GL_BUFFER_MAP_POINTER : exact-integer?
GL_STREAM_DRAW : exact-integer?
GL_STREAM_READ : exact-integer?
GL_STREAM_COPY : exact-integer?
GL_STATIC_DRAW : exact-integer?
GL_STATIC_READ : exact-integer?
GL_STATIC_COPY : exact-integer?
GL_DYNAMIC_DRAW : exact-integer?
GL_DYNAMIC_READ : exact-integer?
GL_DYNAMIC_COPY : exact-integer?
GL_SAMPLES_PASSED : exact-integer?
GL_FOG_COORD_SRC : exact-integer?
```

```
GL_FOG_COORD : exact-integer?
GL_CURRENT_FOG_COORD : exact-integer?
GL_FOG_COORD_ARRAY_TYPE : exact-integer?
GL_FOG_COORD_ARRAY_STRIDE : exact-integer?
GL_FOG_COORD_ARRAY_POINTER : exact-integer?
GL_FOG_COORD_ARRAY : exact-integer?
GL_FOG_COORD_ARRAY_BUFFER_BINDING : exact-integer?
GL_SRC0_RGB : exact-integer?
GL_SRC1_RGB : exact-integer?
GL_SRC2_RGB : exact-integer?
GL_SRC0_ALPHA : exact-integer?
GL_SRC1_ALPHA : exact-integer?
GL_SRC2_ALPHA : exact-integer?
GLU_FALSE : exact-integer?
GLU_TRUE : exact-integer?
GLU_VERSION : exact-integer?
GLU_EXTENSIONS : exact-integer?
GLU_INVALID_ENUM : exact-integer?
GLU_INVALID_VALUE : exact-integer?
GLU_OUT_OF_MEMORY : exact-integer?
GLU_INVALID_OPERATION : exact-integer?
GLU_OUTLINE_POLYGON : exact-integer?
GLU_OUTLINE_PATCH : exact-integer?
GLU_NURBS_ERROR : exact-integer?
GLU_ERROR : exact-integer?
GLU_NURBS_BEGIN : exact-integer?
GLU_NURBS_BEGIN_EXT : exact-integer?
GLU_NURBS_VERTEX : exact-integer?
GLU_NURBS_VERTEX_EXT : exact-integer?
GLU_NURBS_NORMAL : exact-integer?
GLU_NURBS_NORMAL_EXT : exact-integer?
GLU_NURBS_COLOR : exact-integer?
GLU_NURBS_COLOR_EXT : exact-integer?
GLU_NURBS_TEXTURE_COORD : exact-integer?
GLU_NURBS_TEX_COORD_EXT : exact-integer?
GLU_NURBS_END : exact-integer?
GLU_NURBS_END_EXT : exact-integer?
GLU_NURBS_BEGIN_DATA : exact-integer?
GLU_NURBS_BEGIN_DATA_EXT : exact-integer?
GLU_NURBS_VERTEX_DATA : exact-integer?
GLU_NURBS_VERTEX_DATA_EXT : exact-integer?
GLU_NURBS_NORMAL_DATA : exact-integer?
GLU_NURBS_NORMAL_DATA_EXT : exact-integer?
GLU_NURBS_COLOR_DATA : exact-integer?
GLU_NURBS_COLOR_DATA_EXT : exact-integer?
```

```
GLU_NURBS_TEXTURE_COORD_DATA : exact-integer?
GLU_NURBS_TEX_COORD_DATA_EXT : exact-integer?
GLU_NURBS_END_DATA : exact-integer?
GLU_NURBS_END_DATA_EXT : exact-integer?
GLU_NURBS_ERROR1 : exact-integer?
GLU_NURBS_ERROR2 : exact-integer?
GLU_NURBS_ERROR3 : exact-integer?
GLU_NURBS_ERROR4 : exact-integer?
GLU_NURBS_ERROR5 : exact-integer?
GLU_NURBS_ERROR6 : exact-integer?
GLU_NURBS_ERROR7 : exact-integer?
GLU_NURBS_ERROR8 : exact-integer?
GLU_NURBS_ERROR9 : exact-integer?
GLU_NURBS_ERROR10 : exact-integer?
GLU_NURBS_ERROR11 : exact-integer?
GLU_NURBS_ERROR12 : exact-integer?
GLU_NURBS_ERROR13 : exact-integer?
GLU_NURBS_ERROR14 : exact-integer?
GLU_NURBS_ERROR15 : exact-integer?
GLU_NURBS_ERROR16 : exact-integer?
GLU_NURBS_ERROR17 : exact-integer?
GLU_NURBS_ERROR18 : exact-integer?
GLU_NURBS_ERROR19 : exact-integer?
GLU_NURBS_ERROR20 : exact-integer?
GLU_NURBS_ERROR21 : exact-integer?
GLU_NURBS_ERROR22 : exact-integer?
GLU_NURBS_ERROR23 : exact-integer?
GLU_NURBS_ERROR24 : exact-integer?
GLU_NURBS_ERROR25 : exact-integer?
GLU_NURBS_ERROR26 : exact-integer?
GLU_NURBS_ERROR27 : exact-integer?
GLU_NURBS_ERROR28 : exact-integer?
GLU_NURBS_ERROR29 : exact-integer?
GLU_NURBS_ERROR30 : exact-integer?
GLU_NURBS_ERROR31 : exact-integer?
GLU_NURBS_ERROR32 : exact-integer?
GLU_NURBS_ERROR33 : exact-integer?
GLU_NURBS_ERROR34 : exact-integer?
GLU_NURBS_ERROR35 : exact-integer?
GLU_NURBS_ERROR36 : exact-integer?
GLU_NURBS_ERROR37 : exact-integer?
GLU_AUTO_LOAD_MATRIX : exact-integer?
GLU_CULLING : exact-integer?
GLU_SAMPLING_TOLERANCE : exact-integer?
GLU_DISPLAY_MODE : exact-integer?
```

```
GLU_PARAMETRIC_TOLERANCE : exact-integer?
GLU_SAMPLING_METHOD : exact-integer?
GLU_U_STEP : exact-integer?
GLU_V_STEP : exact-integer?
GLU_NURBS_MODE : exact-integer?
GLU_NURBS_MODE_EXT : exact-integer?
GLU_NURBS_TESSELLATOR : exact-integer?
GLU_NURBS_TESSELLATOR_EXT : exact-integer?
GLU_NURBS_RENDERER : exact-integer?
GLU_NURBS_RENDERER_EXT : exact-integer?
GLU_OBJECT_PARAMETRIC_ERROR : exact-integer?
GLU_OBJECT_PARAMETRIC_ERROR_EXT : exact-integer?
GLU_OBJECT_PATH_LENGTH : exact-integer?
GLU_OBJECT_PATH_LENGTH_EXT : exact-integer?
GLU_PATH_LENGTH : exact-integer?
GLU_PARAMETRIC_ERROR : exact-integer?
GLU_DOMAIN_DISTANCE : exact-integer?
GLU_MAP1_TRIM_2 : exact-integer?
GLU_MAP1_TRIM_3 : exact-integer?
GLU_POINT : exact-integer?
GLU_LINE : exact-integer?
GLU_FILL : exact-integer?
GLU_SILHOUETTE : exact-integer?
GLU_SMOOTH : exact-integer?
GLU_FLAT : exact-integer?
GLU_NONE : exact-integer?
GLU_OUTSIDE : exact-integer?
GLU_INSIDE : exact-integer?
GLU_TESS_BEGIN : exact-integer?
GLU_BEGIN : exact-integer?
GLU_TESS_VERTEX : exact-integer?
GLU_VERTEX : exact-integer?
GLU_TESS_END : exact-integer?
GLU_END : exact-integer?
GLU_TESS_ERROR : exact-integer?
GLU_TESS_EDGE_FLAG : exact-integer?
GLU_EDGE_FLAG : exact-integer?
GLU_TESS_COMBINE : exact-integer?
GLU_TESS_BEGIN_DATA : exact-integer?
GLU_TESS_VERTEX_DATA : exact-integer?
GLU_TESS_END_DATA : exact-integer?
GLU_TESS_ERROR_DATA : exact-integer?
GLU_TESS_EDGE_FLAG_DATA : exact-integer?
GLU_TESS_COMBINE_DATA : exact-integer?
GLU_CW : exact-integer?
```

```
GLU_CCW : exact-integer?
GLU_INTERIOR : exact-integer?
GLU_EXTERIOR : exact-integer?
GLU_UNKNOWN : exact-integer?
GLU_TESS_WINDING_RULE : exact-integer?
GLU_TESS_BOUNDARY_ONLY : exact-integer?
GLU_TESS_TOLERANCE : exact-integer?
GLU_TESS_ERROR1 : exact-integer?
GLU_TESS_ERROR2 : exact-integer?
GLU_TESS_ERROR3 : exact-integer?
GLU_TESS_ERROR4 : exact-integer?
GLU_TESS_ERROR5 : exact-integer?
GLU_TESS_ERROR6 : exact-integer?
GLU_TESS_ERROR7 : exact-integer?
GLU_TESS_ERROR8 : exact-integer?
GLU_TESS_MISSING_BEGIN_POLYGON : exact-integer?
GLU_TESS_MISSING_BEGIN_CONTOUR : exact-integer?
GLU_TESS_MISSING_END_POLYGON : exact-integer?
GLU_TESS_MISSING_END_CONTOUR : exact-integer?
GLU_TESS_COORD_TOO_LARGE : exact-integer?
GLU_TESS_NEED_COMBINE_CALLBACK : exact-integer?
GLU_TESS_WINDING_ODD : exact-integer?
GLU_TESS_WINDING_NONZERO : exact-integer?
GLU_TESS_WINDING_POSITIVE : exact-integer?
GLU_TESS_WINDING_NEGATIVE : exact-integer?
GLU_TESS_WINDING_ABS_GEQ_TWO : exact-integer?
GLU_TESS_MAX_COORD : real?
```

All OpenGL-defined constants.

```
(feedback-buffer->gl-float-vector buf) → gl-float-vector?
  buf : feedback-buffer-object?
```

Converts a result from `glFeedbackBuffer` to a vector.

```
(select-buffer->gl-uint-vector buf) → gl-uint-vector?
  buf : select-buffer-object?
```

Converts a result from `glSelectBuffer` to a vector.

3 Racket-Style OpenGL

```
(require sgl)
```
package: sgl

The functions in sgl use Racket style names instead of C style names. To convert a C OpenGL name to a Racket OpenGL name, change the gl prefix to gl-, separate adjacent words with hyphens, and convert to all lower case. Functions that have several variants to accommodate different numbers and types of arguments are collapsed into one or two functions in sgl. For example, sgl provides two vertex functions: vertex and vertex-v. The vertex function accepts 2, 3 or 4 numerical arguments, and the vertex-v function accepts gl-vectors of length 2, 3 or 4. The C language OpenGL interface, in contrast, has 24 vertex functions: glVertex3i, glVertex4fv, etc.

Functions in sgl take symbols instead of integers for GLenum arguments. Each function checks that the given symbol is an acceptable argument and raises an exception if it is not. Given the name of a C-language #define constant, determine the corresponding symbolic argument by removing the leading GL_, converting the letters to lower-case and replacing each _ with -. For example, GL_TRIANGLES becomes 'triangles, and GL_TRIANGLE_STRIP becomes 'triangle-strip. Additionally, the functions check the length of any array arguments to ensure that OpenGL does not attempt to write or read after the array.

The sgl module is not as complete as the sgl/gl module.

Examples:

```
(require sgl sgl/gl-vectors)
(gl-begin 'triangles)
(gl-vertex 1 2 3)
(gl-vertex-v (gl-float-vector 1 2 3 4))
(gl-end)
```

```
(struct gl-selection-record (min-z max-z stack)
    #:extra-constructor-name make-gl-selection-record)
  min-z : real?
  max-z : real?
  stack : ....
```

Represents a selection.

```
gl-accum : procedure?
gl-active-texture : procedure?
gl-alpha-func : procedure?
gl-begin : procedure?
gl-begin-query : procedure?
```

```
gl-blend-color : procedure?
gl-blend-equation : procedure?
gl-blend-func : procedure?
gl-blend-func-separate : procedure?
gl-call-list : procedure?
gl-check-extension : procedure?
gl-clear : procedure?
gl-clear-accum : procedure?
gl-clear-color : procedure?
gl-clear-depth : procedure?
gl-clear-index : procedure?
gl-clear-stencil : procedure?
gl-clip-plane : procedure?
gl-color : procedure?
gl-color-mask : procedure?
gl-color-material : procedure?
gl-color-v : procedure?
gl-copy-pixels : procedure?
gl-cull-face : procedure?
gl-cylinder : procedure?
gl-delete-lists : procedure?
gl-delete-queries : procedure?
gl-depth-func : procedure?
gl-depth-mask : procedure?
gl-depth-range : procedure?
gl-disable : procedure?
gl-disk : procedure?
gl-edge-flag : procedure?
gl-enable : procedure?
gl-end : procedure?
gl-end-list : procedure?
gl-end-query : procedure?
gl-eval-coord : procedure?
gl-eval-coord-v : procedure?
gl-eval-mesh : procedure?
gl-eval-point : procedure?
gl-feedback-buffer->gl-float-vector : procedure?
gl-finish : procedure?
gl-flush : procedure?
gl-front-face : procedure?
gl-frustum : procedure?
gl-gen-lists : procedure?
gl-gen-queries : procedure?
gl-get-error : procedure?
gl-get-string : procedure?
```

```
gl-hint : procedure?
gl-index : procedure?
gl-index-mask : procedure?
gl-index-v : procedure?
gl-init-names : procedure?
gl-is-buffer : procedure?
gl-is-enabled : procedure?
gl-is-list : procedure?
gl-is-query : procedure?
gl-light : procedure?
gl-light-model : procedure?
gl-light-model-v : procedure?
gl-light-v : procedure?
gl-line-stipple : procedure?
gl-line-width : procedure?
gl-list-base : procedure?
gl-load-identity : procedure?
gl-load-matrix : procedure?
gl-load-name : procedure?
gl-load-transpose-matrix : procedure?
gl-look-at : procedure?
gl-map-grid : procedure?
gl-material : procedure?
gl-material-v : procedure?
gl-matrix-mode : procedure?
gl-mult-matrix : procedure?
gl-mult-transpose-matrix : procedure?
gl-multi-tex-coord : procedure?
gl-multi-tex-coord-v : procedure?
gl-new-list : procedure?
gl-new-quadric : procedure?
gl-normal : procedure?
gl-normal-v : procedure?
gl-ortho : procedure?
gl-ortho-2d : procedure?
gl-partial-disk : procedure?
gl-pass-through : procedure?
gl-perspective : procedure?
gl-pick-matrix : procedure?
gl-pixel-store : procedure?
gl-point-parameter : procedure?
gl-point-parameter-v : procedure?
gl-point-size : procedure?
gl-polygon-mode : procedure?
gl-polygon-offset : procedure?
```

```
gl-pop-attrib : procedure?
gl-pop-client-attrib : procedure?
gl-pop-matrix : procedure?
gl-pop-name : procedure?
gl-project : procedure?
gl-push-matrix : procedure?
gl-push-name : procedure?
gl-quadric-draw-style : procedure?
gl-quadric-normals : procedure?
gl-quadric-orientation : procedure?
gl-quadric-texture : procedure?
gl-raster-pos : procedure?
gl-raster-pos-v : procedure?
gl-rect : procedure?
gl-rect-v : procedure?
gl-render-mode : procedure?
gl-rotate : procedure?
gl-sample-coverage : procedure?
gl-scale : procedure?
gl-scissor : procedure?
gl-secondary-color : procedure?
gl-secondary-color-v : procedure?
gl-select-buffer->gl-uint-vector : procedure?
gl-shade-model : procedure?
gl-sphere : procedure?
gl-stencil-func : procedure?
gl-stencil-mask : procedure?
gl-stencil-op : procedure?
gl-tex-coord : procedure?
gl-tex-coord-v : procedure?
gl-tex-gen : procedure?
gl-tex-gen-v : procedure?
gl-translate : procedure?
gl-u-get-string : procedure?
gl-un-project : procedure?
gl-un-project4 : procedure?
gl-vertex : procedure?
gl-vertex-v : procedure?
gl-viewport : procedure?
gl-window-pos : procedure?
gl-window-pos-v : procedure?
```

Racket-style variants of the OpenGL functions.

```
(gl-process-selection vec hits) → (listof gl-selection-record?)
```

```
vec : gl-uint-vector?
hits : exact-nonnegative-integer?
```

Parses the contents of *vec* from the format used by `glSelectBuffer`. The second argument should be the number of hits as returned by `glRenderMode`.

```
(gl-get-gl-version-number) → exact-nonnegative-integer?
```

Returns the run-time OpenGL version number as an integer: `10`, `11`, `12`, `13`, `14`, `15`, or `20`.

```
(gl-get-glu-version-number) → exact-nonnegative-integer?
```

Returns the run-time GLU version number as an integer: `10`, `11`, `12`, or `13`.

4 OpenGL Vectors

```
(require sgl/gl-vectors)
```
package: sgl

The sgl/gl-vectors module supports OpenGL programming with cvectors. In this document and in the error messages, a "gl-vector" is just a cvector, while a "gl-⟨*type*⟩-vector" is a cvector with an appropriate type. Use the sgl/gl-vectors module vectors instead of a Racket cvector directly, because they are specialized to handle the OpenGL types correctly.

```
(gl-vector? v) → boolean?
  v : any/c
(gl-vector->vector vec) → vector?
  vec : cvector?
(gl-vector->list vec) → list?
  vec : cvector?
(gl-vector-length vec) → exact-nonnegative-integer?
  vec : cvector?
(gl-vector-ref vec pos) → any/v
  vec : cvector?
  pos : exact-nonnegative-integer?
(gl-vector-set! vec pos v) → void?
  vec : cvector?
  pos : exact-nonnegative-integer?
  v : any/v
```

Synonyms for cvector?, cvector->vector, cvector-length, etc.

```
(gl-byte-vector? v) → boolean?
  v : any/c
(make-gl-byte-vector pos) → gl-byte-vector?
  pos : exact-nonnegative-integer?
(gl-byte-vector v ...) → gl-byte-vector?
  v : byte?
(vector->gl-byte-vector v ...) → gl-byte-vector?
  v : (vectorof byte?)
(list->gl-byte-vector v ...) → gl-byte-vector?
  v : (listof byte?)
(gl-byte-vector+ vec ...+) → gl-byte-vector?
  vec : gl-byte-vector?
(gl-byte-vector- vec ...+) → gl-byte-vector?
  vec : gl-byte-vector?
(gl-byte-vector* x vec) → gl-byte-vector?
  x : real?
  vec : gl-byte-vector?
```

Operations on vectors of byte elements. The gl-byte-vector+ and gl-byte-vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-byte-vector* function multiplies each element of *vec* by *x*.

```
(gl-ubyte-vector? v) → boolean?
  v : any/c
(make-gl-ubyte-vector pos) → gl-ubyte-vector?
  pos : exact-nonnegative-integer?
(gl-ubyte-vector v ...) → gl-ubyte-vector?
  v : ubyte?
(vector->gl-ubyte-vector v ...) → gl-ubyte-vector?
  v : (vectorof ubyte?)
(list->gl-ubyte-vector v ...) → gl-ubyte-vector?
  v : (listof ubyte?)
(gl-ubyte-vector+ vec ...+) → gl-ubyte-vector?
  vec : gl-ubyte-vector?
(gl-ubyte-vector- vec ...+) → gl-ubyte-vector?
  vec : gl-ubyte-vector?
(gl-ubyte-vector* x vec) → gl-ubyte-vector?
  x : real?
  vec : gl-ubyte-vector?
```

Operations on vectors of ubyte elements. The gl-ubyte-vector+ and gl-ubyte-vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-ubyte-vector* function multiplies each element of *vec* by *x*.

```
(gl-short-vector? v) → boolean?
  v : any/c
(make-gl-short-vector pos) → gl-short-vector?
  pos : exact-nonnegative-integer?
(gl-short-vector v ...) → gl-short-vector?
  v : short?
(vector->gl-short-vector v ...) → gl-short-vector?
  v : (vectorof short?)
(list->gl-short-vector v ...) → gl-short-vector?
  v : (listof short?)
(gl-short-vector+ vec ...+) → gl-short-vector?
  vec : gl-short-vector?
(gl-short-vector- vec ...+) → gl-short-vector?
  vec : gl-short-vector?
(gl-short-vector* x vec) → gl-short-vector?
  x : real?
  vec : gl-short-vector?
```

Operations on vectors of short elements. The gl-short-vector+ and gl-short-

vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-short-vector* function multiplies each element of vec by x.

```
(gl-ushort-vector? v) → boolean?
  v : any/c
(make-gl-ushort-vector pos) → gl-ushort-vector?
  pos : exact-nonnegative-integer?
(gl-ushort-vector v ...) → gl-ushort-vector?
  v : ushort?
(vector->gl-ushort-vector v ...) → gl-ushort-vector?
  v : (vectorof ushort?)
(list->gl-ushort-vector v ...) → gl-ushort-vector?
  v : (listof ushort?)
(gl-ushort-vector+ vec ...+) → gl-ushort-vector?
  vec : gl-ushort-vector?
(gl-ushort-vector- vec ...+) → gl-ushort-vector?
  vec : gl-ushort-vector?
(gl-ushort-vector* x vec) → gl-ushort-vector?
  x : real?
  vec : gl-ushort-vector?
```

Operations on vectors of ushort elements. The gl-ushort-vector+ and gl-ushort-vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-ushort-vector* function multiplies each element of vec by x.

```
(gl-int-vector? v) → boolean?
  v : any/c
(make-gl-int-vector pos) → gl-int-vector?
  pos : exact-nonnegative-integer?
(gl-int-vector v ...) → gl-int-vector?
  v : int?
(vector->gl-int-vector v ...) → gl-int-vector?
  v : (vectorof int?)
(list->gl-int-vector v ...) → gl-int-vector?
  v : (listof int?)
(gl-int-vector+ vec ...+) → gl-int-vector?
  vec : gl-int-vector?
(gl-int-vector- vec ...+) → gl-int-vector?
  vec : gl-int-vector?
(gl-int-vector* x vec) → gl-int-vector?
  x : real?
  vec : gl-int-vector?
```

Operations on vectors of int elements. The gl-int-vector+ and gl-int-vector- functions compute the element-by-element sum and difference of the given vectors, respectively.

The gl-int-vector* function multiplies each element of vec by x.

```
(gl-uint-vector? v) → boolean?
  v : any/c
(make-gl-uint-vector pos) → gl-uint-vector?
  pos : exact-nonnegative-integer?
(gl-uint-vector v ...) → gl-uint-vector?
  v : uint?
(vector->gl-uint-vector v ...) → gl-uint-vector?
  v : (vectorof uint?)
(list->gl-uint-vector v ...) → gl-uint-vector?
  v : (listof uint?)
(gl-uint-vector+ vec ...+) → gl-uint-vector?
  vec : gl-uint-vector?
(gl-uint-vector- vec ...+) → gl-uint-vector?
  vec : gl-uint-vector?
(gl-uint-vector* x vec) → gl-uint-vector?
  x : real?
  vec : gl-uint-vector?
```

Operations on vectors of uint elements. The gl-uint-vector+ and gl-uint-vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-uint-vector* function multiplies each element of vec by x.

```
(gl-float-vector? v) → boolean?
  v : any/c
(make-gl-float-vector pos) → gl-float-vector?
  pos : exact-nonnegative-integer?
(gl-float-vector v ...) → gl-float-vector?
  v : float?
(vector->gl-float-vector v ...) → gl-float-vector?
  v : (vectorof float?)
(list->gl-float-vector v ...) → gl-float-vector?
  v : (listof float?)
(gl-float-vector+ vec ...+) → gl-float-vector?
  vec : gl-float-vector?
(gl-float-vector- vec ...+) → gl-float-vector?
  vec : gl-float-vector?
(gl-float-vector* x vec) → gl-float-vector?
  x : real?
  vec : gl-float-vector?
```

Operations on vectors of float elements. The gl-float-vector+ and gl-float-vector- functions compute the element-by-element sum and difference of the given vectors, respectively. The gl-float-vector* function multiplies each element of vec by x.

```
(gl-double-vector? v) → boolean?
  v : any/c
(make-gl-double-vector pos) → gl-double-vector?
  pos : exact-nonnegative-integer?
(gl-double-vector v ...) → gl-double-vector?
  v : double?
(vector->gl-double-vector v ...) → gl-double-vector?
  v : (vectorof double?)
(list->gl-double-vector v ...) → gl-double-vector?
  v : (listof double?)
(gl-double-vector+ vec ...+) → gl-double-vector?
  vec : gl-double-vector?
(gl-double-vector- vec ...+) → gl-double-vector?
  vec : gl-double-vector?
(gl-double-vector* x vec) → gl-double-vector?
  x : real?
  vec : gl-double-vector?
```

Operations on vectors of `double` elements. The `gl-double-vector+` and `gl-double-vector-` functions compute the element-by-element sum and difference of the given vectors, respectively. The `gl-double-vector*` function multiplies each element of `vec` by `x`.

```
(gl-boolean-vector? v) → boolean?
  v : any/c
(make-gl-boolean-vector pos) → gl-boolean-vector?
  pos : exact-nonnegative-integer?
(gl-boolean-vector v ...) → gl-boolean-vector?
  v : boolean?
(vector->gl-boolean-vector v ...) → gl-boolean-vector?
  v : (vectorof boolean?)
(list->gl-boolean-vector v ...) → gl-boolean-vector?
  v : (listof boolean?)
(gl-boolean-vector+ vec ...+) → gl-boolean-vector?
  vec : gl-boolean-vector?
(gl-boolean-vector- vec ...+) → gl-boolean-vector?
  vec : gl-boolean-vector?
(gl-boolean-vector* x vec) → gl-boolean-vector?
  x : real?
  vec : gl-boolean-vector?
```

Operations on vectors of `boolean` elements. The `gl-boolean-vector+` and `gl-boolean-vector-` functions compute the element-by-element sum and difference of the given vectors, respectively. The `gl-boolean-vector*` function multiplies each element of `vec` by `x`.

```
(gl-vector-norm vec) → real?
  vec : gl-vector?
```

Returns the square root of the sum of the squares of the elements of *vec*.

5 Bitmaps

```
(require sgl/bitmap)
```
package: sgl

```
(bitmap->gl-list  bitmap
                  [#:with-gl with-gl-proc
                   #:mask mask])          → exact-integer?
  bitmap : (is-a?/c bitmap%)
  with-gl-proc : ((-> any) . -> . any) = (lambda (f) (f))
  mask : (or/c (is-a?/c bitmap%) false/c)
       = (send bitmap get-loaded-mask)
```

Converts the given bitmap into an OpenGL list that can be rendered with `gl-call-list` or `glCallList`. The rendered object is a square on the z=0 plane with corners at (0,0) and (1,1).

The *with-gl-proc* must accept a thunk and call it while the relevant OpenGL context is selected. Otherwise, the relevant OpenGL context must be selected already.

If *mask* is not `#f`, it is used as the mask bitmap for extracting alpha values.

6 Initialization

`(require sgl/init)` package: `sgl`

Requiring the `sgl/init` library initializes platform-specific OpenGL state to help avoid crashes when OpenGL commands are incorrectly used without a current context. This library is `required` by `sgl` and `sgl/gl`, so it normally does not need to be `required` explicitly.

On Mac OS X, `sgl/init` checks whether any GL context is current, and if not, it creates a dummy context and sets it as the current context.

Index

bitmap->gl-list
Bitmaps
C-Style OpenGL
feedback-buffer->gl-float-vector
GFclampf
GFfloat
gl-accum
gl-active-texture
gl-alpha-func
gl-begin
gl-begin-query
gl-blend-color
gl-blend-equation
gl-blend-func
gl-blend-func-separate
gl-boolean-vector
gl-boolean-vector*
gl-boolean-vector+
gl-boolean-vector-
gl-boolean-vector?
gl-byte-vector
gl-byte-vector*
gl-byte-vector+
gl-byte-vector-
gl-byte-vector?
gl-call-list
gl-check-extension
gl-clear
gl-clear-accum
gl-clear-color
gl-clear-depth
gl-clear-index
gl-clear-stencil
gl-clip-plane
gl-color
gl-color-mask
gl-color-material
gl-color-v
gl-copy-pixels
gl-cull-face
gl-cylinder
gl-delete-lists
gl-delete-queries
gl-depth-func
gl-depth-mask
gl-depth-range
gl-disable
gl-disk
gl-double-vector
gl-double-vector*
gl-double-vector+
gl-double-vector-
gl-double-vector?
gl-edge-flag
gl-enable
gl-end
gl-end-list
gl-end-query
gl-eval-coord
gl-eval-coord-v
gl-eval-mesh
gl-eval-point
gl-feedback-buffer->gl-float-vector
gl-finish
gl-float-vector
gl-float-vector*
gl-float-vector+
gl-float-vector-
gl-float-vector?
gl-flush
gl-front-face
gl-frustum
gl-gen-lists
gl-gen-queries
gl-get-error
gl-get-gl-version-number
gl-get-glu-version-number
gl-get-string
gl-hint
gl-index
gl-index-mask

gl-index-v
gl-init-names
gl-int-vector
gl-int-vector*
gl-int-vector+
gl-int-vector-
gl-int-vector?
gl-is-buffer
gl-is-enabled
gl-is-list
gl-is-query
gl-light
gl-light-model
gl-light-model-v
gl-light-v
gl-line-stipple
gl-line-width
gl-list-base
gl-load-identity
gl-load-matrix
gl-load-name
gl-load-transpose-matrix
gl-look-at
gl-map-grid
gl-material
gl-material-v
gl-matrix-mode
gl-mult-matrix
gl-mult-transpose-matrix
gl-multi-tex-coord
gl-multi-tex-coord-v
gl-new-list
gl-new-quadric
gl-normal
gl-normal-v
gl-ortho
gl-ortho-2d
gl-partial-disk
gl-pass-through
gl-perspective
gl-pick-matrix
gl-pixel-store
gl-point-parameter
gl-point-parameter-v
gl-point-size
gl-polygon-mode
gl-polygon-offset
gl-pop-attrib
gl-pop-client-attrib
gl-pop-matrix
gl-pop-name
gl-process-selection
gl-project
gl-push-matrix
gl-push-name
gl-quadric-draw-style
gl-quadric-normals
gl-quadric-orientation
gl-quadric-texture
gl-raster-pos
gl-raster-pos-v
gl-rect
gl-rect-v
gl-render-mode
gl-rotate
gl-sample-coverage
gl-scale
gl-scissor
gl-secondary-color
gl-secondary-color-v
gl-select-buffer->gl-uint-vector
gl-selection-record (struct)
gl-selection-record-max-z
gl-selection-record-min-z
gl-selection-record-stack
gl-selection-record?
gl-shade-model
gl-short-vector
gl-short-vector*
gl-short-vector+
gl-short-vector-
gl-short-vector?
gl-sphere
gl-stencil-func

gl-stencil-mask
gl-stencil-op
gl-tex-coord
gl-tex-coord-v
gl-tex-gen
gl-tex-gen-v
gl-translate
gl-u-get-string
gl-ubyte-vector
gl-ubyte-vector*
gl-ubyte-vector+
gl-ubyte-vector-
gl-ubyte-vector?
gl-uint-vector
gl-uint-vector*
gl-uint-vector+
gl-uint-vector-
gl-uint-vector?
gl-un-project
gl-un-project4
gl-ushort-vector
gl-ushort-vector*
gl-ushort-vector+
gl-ushort-vector-
gl-ushort-vector?
gl-vector->list
gl-vector->vector
gl-vector-length
gl-vector-norm
gl-vector-ref
gl-vector-set!
gl-vector?
gl-vertex
gl-vertex-v
gl-viewport
gl-window-pos
gl-window-pos-v

GL_2_BYTES
GL_2D
GL_3_BYTES
GL_3D
GL_3D_COLOR
GL_3D_COLOR_TEXTURE
GL_4_BYTES
GL_4D_COLOR_TEXTURE
GL_ACCUM
GL_ACCUM_ALPHA_BITS
GL_ACCUM_BLUE_BITS
GL_ACCUM_BUFFER_BIT
GL_ACCUM_CLEAR_VALUE
GL_ACCUM_GREEN_BITS
GL_ACCUM_RED_BITS
GL_ACTIVE_TEXTURE
GL_ADD
GL_ADD_SIGNED
GL_ALIASED_LINE_WIDTH_RANGE
GL_ALIASED_POINT_SIZE_RANGE
GL_ALL_ATTRIB_BITS
GL_ALL_CLIENT_ATTRIB_BITS
GL_ALPHA
GL_ALPHA12
GL_ALPHA16
GL_ALPHA4
GL_ALPHA8
GL_ALPHA_BIAS
GL_ALPHA_BITS
GL_ALPHA_SCALE
GL_ALPHA_TEST
GL_ALPHA_TEST_FUNC
GL_ALPHA_TEST_REF
GL_ALWAYS
GL_AMBIENT
GL_AMBIENT_AND_DIFFUSE
GL_AND
GL_AND_INVERTED
GL_AND_REVERSE
GL_ARRAY_BUFFER
GL_ARRAY_BUFFER_BINDING
GL_ATTRIB_STACK_DEPTH
GL_AUTO_NORMAL
GL_AUX0
GL_AUX1
GL_AUX2

GL_AUX3
GL_AUX_BUFFERS
GL_BACK
GL_BACK_LEFT
GL_BACK_RIGHT
GL_BGR
GL_BGRA
GL_BITMAP
GL_BITMAP_TOKEN
GL_BLEND
GL_BLEND_COLOR
GL_BLEND_DST
GL_BLEND_DST_ALPHA
GL_BLEND_DST_RGB
GL_BLEND_EQUATION
GL_BLEND_SRC
GL_BLEND_SRC_ALPHA
GL_BLEND_SRC_RGB
GL_BLUE
GL_BLUE_BIAS
GL_BLUE_BITS
GL_BLUE_SCALE
GL_BUFFER_ACCESS
GL_BUFFER_MAP_POINTER
GL_BUFFER_MAPPED
GL_BUFFER_SIZE
GL_BUFFER_USAGE
GL_BYTE
GL_C3F_V3F
GL_C4F_N3F_V3F
GL_C4UB_V2F
GL_C4UB_V3F
GL_CCW
GL_CLAMP
GL_CLAMP_TO_BORDER
GL_CLAMP_TO_EDGE
GL_CLEAR
GL_CLIENT_ACTIVE_TEXTURE
GL_CLIENT_ALL_ATTRIB_BITS
GL_CLIENT_ATTRIB_STACK_DEPTH
GL_CLIENT_PIXEL_STORE_BIT
GL_CLIENT_VERTEX_ARRAY_BIT
GL_CLIP_PLANE0
GL_CLIP_PLANE1
GL_CLIP_PLANE2
GL_CLIP_PLANE3
GL_CLIP_PLANE4
GL_CLIP_PLANE5
GL_COEFF
GL_COLOR
GL_COLOR_ARRAY
GL_COLOR_ARRAY_BUFFER_BINDING
GL_COLOR_ARRAY_POINTER
GL_COLOR_ARRAY_SIZE
GL_COLOR_ARRAY_STRIDE
GL_COLOR_ARRAY_TYPE
GL_COLOR_BUFFER_BIT
GL_COLOR_CLEAR_VALUE
GL_COLOR_INDEX
GL_COLOR_INDEXES
GL_COLOR_LOGIC_OP
GL_COLOR_MATERIAL
GL_COLOR_MATERIAL_FACE
GL_COLOR_MATERIAL_PARAMETER
GL_COLOR_MATRIX
GL_COLOR_MATRIX_STACK_DEPTH
GL_COLOR_SUM
GL_COLOR_TABLE
GL_COLOR_TABLE_ALPHA_SIZE
GL_COLOR_TABLE_BIAS
GL_COLOR_TABLE_BLUE_SIZE
GL_COLOR_TABLE_FORMAT
GL_COLOR_TABLE_GREEN_SIZE
GL_COLOR_TABLE_INTENSITY_SIZE
GL_COLOR_TABLE_LUMINANCE_SIZE
GL_COLOR_TABLE_RED_SIZE
GL_COLOR_TABLE_SCALE
GL_COLOR_TABLE_WIDTH
GL_COLOR_WRITEMASK
GL_COMBINE
GL_COMBINE_ALPHA
GL_COMBINE_RGB
GL_COMPARE_R_TO_TEXTURE
GL_COMPILE

GL_COMPILE_AND_EXECUTE
GL_COMPRESSED_ALPHA
GL_COMPRESSED_INTENSITY
GL_COMPRESSED_LUMINANCE
GL_COMPRESSED_LUMINANCE_ALPHA
GL_COMPRESSED_RGB
GL_COMPRESSED_RGBA
GL_COMPRESSED_TEXTURE_FORMATS
GL_CONSTANT
GL_CONSTANT_ALPHA
GL_CONSTANT_ATTENUATION
GL_CONSTANT_BORDER
GL_CONSTANT_COLOR
GL_CONVOLUTION_1D
GL_CONVOLUTION_2D
GL_CONVOLUTION_BORDER_COLOR
GL_CONVOLUTION_BORDER_MODE
GL_CONVOLUTION_FILTER_BIAS
GL_CONVOLUTION_FILTER_SCALE
GL_CONVOLUTION_FORMAT
GL_CONVOLUTION_HEIGHT
GL_CONVOLUTION_WIDTH
GL_COPY
GL_COPY_INVERTED
GL_COPY_PIXEL_TOKEN
GL_CULL_FACE
GL_CULL_FACE_MODE
GL_CURRENT_BIT
GL_CURRENT_COLOR
GL_CURRENT_FOG_COORD
GL_CURRENT_FOG_COORDINATE
GL_CURRENT_INDEX
GL_CURRENT_NORMAL
GL_CURRENT_QUERY
GL_CURRENT_RASTER_COLOR
GL_CURRENT_RASTER_DISTANCE
GL_CURRENT_RASTER_INDEX
GL_CURRENT_RASTER_POSITION
GL_CURRENT_RASTER_POSITION_VALID
GL_CURRENT_RASTER_TEXTURE_COORDS
GL_CURRENT_SECONDARY_COLOR
GL_CURRENT_TEXTURE_COORDS
GL_CW
GL_DECAL
GL_DECR
GL_DECR_WRAP
GL_DEPTH
GL_DEPTH_BIAS
GL_DEPTH_BITS
GL_DEPTH_BUFFER_BIT
GL_DEPTH_CLEAR_VALUE
GL_DEPTH_COMPONENT
GL_DEPTH_COMPONENT16
GL_DEPTH_COMPONENT24
GL_DEPTH_COMPONENT32
GL_DEPTH_FUNC
GL_DEPTH_RANGE
GL_DEPTH_SCALE
GL_DEPTH_TEST
GL_DEPTH_TEXTURE_MODE
GL_DEPTH_WRITEMASK
GL_DIFFUSE
GL_DITHER
GL_DOMAIN
GL_DONT_CARE
GL_DOT3_RGB
GL_DOT3_RGBA
GL_DOUBLE
GL_DOUBLEBUFFER
GL_DRAW_BUFFER
GL_DRAW_PIXEL_TOKEN
GL_DST_ALPHA
GL_DST_COLOR
GL_DYNAMIC_COPY
GL_DYNAMIC_DRAW
GL_DYNAMIC_READ
GL_EDGE_FLAG
GL_EDGE_FLAG_ARRAY
GL_EDGE_FLAG_ARRAY_BUFFER_BINDING
GL_EDGE_FLAG_ARRAY_POINTER
GL_EDGE_FLAG_ARRAY_STRIDE
GL_ELEMENT_ARRAY_BUFFER
GL_ELEMENT_ARRAY_BUFFER_BINDING
GL_EMISSION

GL_ENABLE_BIT
GL_EQUAL
GL_EQUIV
GL_EVAL_BIT
GL_EXP
GL_EXP2
GL_EXTENSIONS
GL_EYE_LINEAR
GL_EYE_PLANE
GL_FALSE
GL_FALSE
GL_FASTEST
GL_FEEDBACK
GL_FEEDBACK_BUFFER_POINTER
GL_FEEDBACK_BUFFER_SIZE
GL_FEEDBACK_BUFFER_TYPE
GL_FILL
GL_FLAT
GL_FLOAT
GL_FOG
GL_FOG_BIT
GL_FOG_COLOR
GL_FOG_COORD
GL_FOG_COORD_ARRAY
GL_FOG_COORD_ARRAY_BUFFER_BINDING
GL_FOG_COORD_ARRAY_POINTER
GL_FOG_COORD_ARRAY_STRIDE
GL_FOG_COORD_ARRAY_TYPE
GL_FOG_COORD_SRC
GL_FOG_COORDINATE
GL_FOG_COORDINATE_ARRAY
GL_FOG_COORDINATE_ARRAY_BUFFER_BINDING
GL_FOG_COORDINATE_ARRAY_POINTER
GL_FOG_COORDINATE_ARRAY_STRIDE
GL_FOG_COORDINATE_ARRAY_TYPE
GL_FOG_COORDINATE_SOURCE
GL_FOG_DENSITY
GL_FOG_END
GL_FOG_HINT
GL_FOG_INDEX
GL_FOG_MODE
GL_FOG_START
GL_FRAGMENT_DEPTH
GL_FRONT
GL_FRONT_AND_BACK
GL_FRONT_FACE
GL_FRONT_LEFT
GL_FRONT_RIGHT
GL_FUNC_ADD
GL_FUNC_REVERSE_SUBTRACT
GL_FUNC_SUBTRACT
GL_GENERATE_MIPMAP
GL_GENERATE_MIPMAP_HINT
GL_GEQUAL
GL_GREATER
GL_GREEN
GL_GREEN_BIAS
GL_GREEN_BITS
GL_GREEN_SCALE
GL_HINT_BIT
GL_HISTOGRAM
GL_HISTOGRAM_ALPHA_SIZE
GL_HISTOGRAM_BLUE_SIZE
GL_HISTOGRAM_FORMAT
GL_HISTOGRAM_GREEN_SIZE
GL_HISTOGRAM_LUMINANCE_SIZE
GL_HISTOGRAM_RED_SIZE
GL_HISTOGRAM_SINK
GL_HISTOGRAM_WIDTH
GL_INCR
GL_INCR_WRAP
GL_INDEX_ARRAY
GL_INDEX_ARRAY_BUFFER_BINDING
GL_INDEX_ARRAY_POINTER
GL_INDEX_ARRAY_STRIDE
GL_INDEX_ARRAY_TYPE
GL_INDEX_BITS
GL_INDEX_CLEAR_VALUE
GL_INDEX_LOGIC_OP
GL_INDEX_MODE
GL_INDEX_OFFSET
GL_INDEX_SHIFT
GL_INDEX_WRITEMASK
GL_INT

GL_INTENSITY
GL_INTENSITY12
GL_INTENSITY16
GL_INTENSITY4
GL_INTENSITY8
GL_INTERPOLATE
GL_INVALID_ENUM
GL_INVALID_OPERATION
GL_INVALID_VALUE
GL_INVERT
GL_KEEP
GL_LEFT
GL_LEQUAL
GL_LESS
GL_LIGHT0
GL_LIGHT1
GL_LIGHT2
GL_LIGHT3
GL_LIGHT4
GL_LIGHT5
GL_LIGHT6
GL_LIGHT7
GL_LIGHT_MODEL_AMBIENT
GL_LIGHT_MODEL_COLOR_CONTROL
GL_LIGHT_MODEL_LOCAL_VIEWER
GL_LIGHT_MODEL_TWO_SIDE
GL_LIGHTING
GL_LIGHTING_BIT
GL_LINE
GL_LINE_BIT
GL_LINE_LOOP
GL_LINE_RESET_TOKEN
GL_LINE_SMOOTH
GL_LINE_SMOOTH_HINT
GL_LINE_STIPPLE
GL_LINE_STIPPLE_PATTERN
GL_LINE_STIPPLE_REPEAT
GL_LINE_STRIP
GL_LINE_TOKEN
GL_LINE_WIDTH
GL_LINE_WIDTH_GRANULARITY
GL_LINE_WIDTH_RANGE
GL_LINEAR
GL_LINEAR_ATTENUATION
GL_LINEAR_MIPMAP_LINEAR
GL_LINEAR_MIPMAP_NEAREST
GL_LINES
GL_LIST_BASE
GL_LIST_BIT
GL_LIST_INDEX
GL_LIST_MODE
GL_LOAD
GL_LOGIC_OP
GL_LOGIC_OP_MODE
GL_LUMINANCE
GL_LUMINANCE12
GL_LUMINANCE12_ALPHA12
GL_LUMINANCE12_ALPHA4
GL_LUMINANCE16
GL_LUMINANCE16_ALPHA16
GL_LUMINANCE4
GL_LUMINANCE4_ALPHA4
GL_LUMINANCE6_ALPHA2
GL_LUMINANCE8
GL_LUMINANCE8_ALPHA8
GL_LUMINANCE_ALPHA
GL_MAP1_COLOR_4
GL_MAP1_GRID_DOMAIN
GL_MAP1_GRID_SEGMENTS
GL_MAP1_INDEX
GL_MAP1_NORMAL
GL_MAP1_TEXTURE_COORD_1
GL_MAP1_TEXTURE_COORD_2
GL_MAP1_TEXTURE_COORD_3
GL_MAP1_TEXTURE_COORD_4
GL_MAP1_VERTEX_3
GL_MAP1_VERTEX_4
GL_MAP2_COLOR_4
GL_MAP2_GRID_DOMAIN
GL_MAP2_GRID_SEGMENTS
GL_MAP2_INDEX
GL_MAP2_NORMAL
GL_MAP2_TEXTURE_COORD_1
GL_MAP2_TEXTURE_COORD_2

GL_MAP2_TEXTURE_COORD_3
GL_MAP2_TEXTURE_COORD_4
GL_MAP2_VERTEX_3
GL_MAP2_VERTEX_4
GL_MAP_COLOR
GL_MAP_STENCIL
GL_MATRIX_MODE
GL_MAX
GL_MAX_3D_TEXTURE_SIZE
GL_MAX_ATTRIB_STACK_DEPTH
GL_MAX_CLIENT_ATTRIB_STACK_DEPTH
GL_MAX_CLIP_PLANES
GL_MAX_COLOR_MATRIX_STACK_DEPTH
GL_MAX_CONVOLUTION_HEIGHT
GL_MAX_CONVOLUTION_WIDTH
GL_MAX_CUBE_MAP_TEXTURE_SIZE
GL_MAX_ELEMENTS_INDICES
GL_MAX_ELEMENTS_VERTICES
GL_MAX_EVAL_ORDER
GL_MAX_LIGHTS
GL_MAX_LIST_NESTING
GL_MAX_MODELVIEW_STACK_DEPTH
GL_MAX_NAME_STACK_DEPTH
GL_MAX_PIXEL_MAP_TABLE
GL_MAX_PROJECTION_STACK_DEPTH
GL_MAX_TEXTURE_LOD_BIAS
GL_MAX_TEXTURE_SIZE
GL_MAX_TEXTURE_STACK_DEPTH
GL_MAX_TEXTURE_UNITS
GL_MAX_VIEWPORT_DIMS
GL_MIN
GL_MINMAX
GL_MINMAX_FORMAT
GL_MINMAX_SINK
GL_MIRRORED_REPEAT
GL_MODELVIEW
GL_MODELVIEW_MATRIX
GL_MODELVIEW_STACK_DEPTH
GL_MODULATE
GL_MULT
GL_MULTISAMPLE
GL_MULTISAMPLE_BIT
GL_N3F_V3F
GL_NAME_STACK_DEPTH
GL_NAND
GL_NEAREST
GL_NEAREST_MIPMAP_LINEAR
GL_NEAREST_MIPMAP_NEAREST
GL_NEVER
GL_NICEST
GL_NO_ERROR
GL_NONE
GL_NOOP
GL_NOR
GL_NORMAL_ARRAY
GL_NORMAL_ARRAY_BUFFER_BINDING
GL_NORMAL_ARRAY_POINTER
GL_NORMAL_ARRAY_STRIDE
GL_NORMAL_ARRAY_TYPE
GL_NORMAL_MAP
GL_NORMALIZE
GL_NOTEQUAL
GL_NUM_COMPRESSED_TEXTURE_FORMATS
GL_OBJECT_LINEAR
GL_OBJECT_PLANE
GL_ONE
GL_ONE_MINUS_CONSTANT_ALPHA
GL_ONE_MINUS_CONSTANT_COLOR
GL_ONE_MINUS_DST_ALPHA
GL_ONE_MINUS_DST_COLOR
GL_ONE_MINUS_SRC_ALPHA
GL_ONE_MINUS_SRC_COLOR
GL_OPERAND0_ALPHA
GL_OPERAND0_RGB
GL_OPERAND1_ALPHA
GL_OPERAND1_RGB
GL_OPERAND2_ALPHA
GL_OPERAND2_RGB
GL_OR
GL_OR_INVERTED
GL_OR_REVERSE
GL_ORDER
GL_OUT_OF_MEMORY
GL_PACK_ALIGNMENT

GL_PACK_IMAGE_HEIGHT
GL_PACK_LSB_FIRST
GL_PACK_ROW_LENGTH
GL_PACK_SKIP_IMAGES
GL_PACK_SKIP_PIXELS
GL_PACK_SKIP_ROWS
GL_PACK_SWAP_BYTES
GL_PASS_THROUGH_TOKEN
GL_PERSPECTIVE_CORRECTION_HINT
GL_PIXEL_MAP_A_TO_A
GL_PIXEL_MAP_A_TO_A_SIZE
GL_PIXEL_MAP_B_TO_B
GL_PIXEL_MAP_B_TO_B_SIZE
GL_PIXEL_MAP_G_TO_G
GL_PIXEL_MAP_G_TO_G_SIZE
GL_PIXEL_MAP_I_TO_A
GL_PIXEL_MAP_I_TO_A_SIZE
GL_PIXEL_MAP_I_TO_B
GL_PIXEL_MAP_I_TO_B_SIZE
GL_PIXEL_MAP_I_TO_G
GL_PIXEL_MAP_I_TO_G_SIZE
GL_PIXEL_MAP_I_TO_I
GL_PIXEL_MAP_I_TO_I_SIZE
GL_PIXEL_MAP_I_TO_R
GL_PIXEL_MAP_I_TO_R_SIZE
GL_PIXEL_MAP_R_TO_R
GL_PIXEL_MAP_R_TO_R_SIZE
GL_PIXEL_MAP_S_TO_S
GL_PIXEL_MAP_S_TO_S_SIZE
GL_PIXEL_MODE_BIT
GL_POINT
GL_POINT_BIT
GL_POINT_DISTANCE_ATTENUATION
GL_POINT_FADE_THRESHOLD_SIZE
GL_POINT_SIZE
GL_POINT_SIZE_GRANULARITY
GL_POINT_SIZE_MAX
GL_POINT_SIZE_MIN
GL_POINT_SIZE_RANGE
GL_POINT_SMOOTH
GL_POINT_SMOOTH_HINT
GL_POINT_TOKEN
GL_POINTS
GL_POLYGON
GL_POLYGON_BIT
GL_POLYGON_MODE
GL_POLYGON_OFFSET_FACTOR
GL_POLYGON_OFFSET_FILL
GL_POLYGON_OFFSET_LINE
GL_POLYGON_OFFSET_POINT
GL_POLYGON_OFFSET_UNITS
GL_POLYGON_SMOOTH
GL_POLYGON_SMOOTH_HINT
GL_POLYGON_STIPPLE
GL_POLYGON_STIPPLE_BIT
GL_POLYGON_TOKEN
GL_POSITION
GL_POST_COLOR_MATRIX_ALPHA_BIAS
GL_POST_COLOR_MATRIX_ALPHA_SCALE
GL_POST_COLOR_MATRIX_BLUE_BIAS
GL_POST_COLOR_MATRIX_BLUE_SCALE
GL_POST_COLOR_MATRIX_COLOR_TABLE
GL_POST_COLOR_MATRIX_GREEN_BIAS
GL_POST_COLOR_MATRIX_GREEN_SCALE
GL_POST_COLOR_MATRIX_RED_BIAS
GL_POST_COLOR_MATRIX_RED_SCALE
GL_POST_CONVOLUTION_ALPHA_BIAS
GL_POST_CONVOLUTION_ALPHA_SCALE
GL_POST_CONVOLUTION_BLUE_BIAS
GL_POST_CONVOLUTION_BLUE_SCALE
GL_POST_CONVOLUTION_COLOR_TABLE
GL_POST_CONVOLUTION_GREEN_BIAS
GL_POST_CONVOLUTION_GREEN_SCALE
GL_POST_CONVOLUTION_RED_BIAS
GL_POST_CONVOLUTION_RED_SCALE
GL_PREVIOUS
GL_PRIMARY_COLOR
GL_PROJECTION
GL_PROJECTION_MATRIX
GL_PROJECTION_STACK_DEPTH
GL_PROXY_COLOR_TABLE
GL_PROXY_HISTOGRAM
GL_PROXY_POST_COLOR_MATRIX_COLOR_TABLE
GL_PROXY_POST_CONVOLUTION_COLOR_TABLE

GL_PROXY_TEXTURE_1D
GL_PROXY_TEXTURE_2D
GL_PROXY_TEXTURE_3D
GL_PROXY_TEXTURE_CUBE_MAP
GL_Q
GL_QUAD_STRIP
GL_QUADRATIC_ATTENUATION
GL_QUADS
GL_QUERY_COUNTER_BITS
GL_QUERY_RESULT
GL_QUERY_RESULT_AVAILABLE
GL_R
GL_R3_G3_B2
GL_READ_BUFFER
GL_READ_ONLY
GL_READ_WRITE
GL_RED
GL_RED_BIAS
GL_RED_BITS
GL_RED_SCALE
GL_REDUCE
GL_REFLECTION_MAP
GL_RENDER
GL_RENDER_MODE
GL_RENDERER
GL_REPEAT
GL_REPLACE
GL_REPLICATE_BORDER
GL_RESCALE_NORMAL
GL_RETURN
GL_RGB
GL_RGB10
GL_RGB10_A2
GL_RGB12
GL_RGB16
GL_RGB4
GL_RGB5
GL_RGB5_A1
GL_RGB8
GL_RGB_SCALE
GL_RGBA
GL_RGBA12
GL_RGBA16
GL_RGBA2
GL_RGBA4
GL_RGBA8
GL_RGBA_MODE
GL_RIGHT
GL_S
GL_SAMPLE_ALPHA_TO_COVERAGE
GL_SAMPLE_ALPHA_TO_ONE
GL_SAMPLE_BUFFERS
GL_SAMPLE_COVERAGE
GL_SAMPLE_COVERAGE_INVERT
GL_SAMPLE_COVERAGE_VALUE
GL_SAMPLES
GL_SAMPLES_PASSED
GL_SCISSOR_BIT
GL_SCISSOR_BOX
GL_SCISSOR_TEST
GL_SECONDARY_COLOR_ARRAY
GL_SECONDARY_COLOR_ARRAY_BUFFER_BINDING
GL_SECONDARY_COLOR_ARRAY_POINTER
GL_SECONDARY_COLOR_ARRAY_SIZE
GL_SECONDARY_COLOR_ARRAY_STRIDE
GL_SECONDARY_COLOR_ARRAY_TYPE
GL_SELECT
GL_SELECTION_BUFFER_POINTER
GL_SELECTION_BUFFER_SIZE
GL_SEPARABLE_2D
GL_SEPARATE_SPECULAR_COLOR
GL_SET
GL_SHADE_MODEL
GL_SHININESS
GL_SHORT
GL_SINGLE_COLOR
GL_SMOOTH
GL_SMOOTH_LINE_WIDTH_GRANULARITY
GL_SMOOTH_LINE_WIDTH_RANGE
GL_SMOOTH_POINT_SIZE_GRANULARITY
GL_SMOOTH_POINT_SIZE_RANGE
GL_SOURCE0_ALPHA
GL_SOURCE0_RGB
GL_SOURCE1_ALPHA

GL_SOURCE1_RGB
GL_SOURCE2_ALPHA
GL_SOURCE2_RGB
GL_SPECULAR
GL_SPHERE_MAP
GL_SPOT_CUTOFF
GL_SPOT_DIRECTION
GL_SPOT_EXPONENT
GL_SRC0_ALPHA
GL_SRC0_RGB
GL_SRC1_ALPHA
GL_SRC1_RGB
GL_SRC2_ALPHA
GL_SRC2_RGB
GL_SRC_ALPHA
GL_SRC_ALPHA_SATURATE
GL_SRC_COLOR
GL_STACK_OVERFLOW
GL_STACK_UNDERFLOW
GL_STATIC_COPY
GL_STATIC_DRAW
GL_STATIC_READ
GL_STENCIL
GL_STENCIL_BITS
GL_STENCIL_BUFFER_BIT
GL_STENCIL_CLEAR_VALUE
GL_STENCIL_FAIL
GL_STENCIL_FUNC
GL_STENCIL_INDEX
GL_STENCIL_PASS_DEPTH_FAIL
GL_STENCIL_PASS_DEPTH_PASS
GL_STENCIL_REF
GL_STENCIL_TEST
GL_STENCIL_VALUE_MASK
GL_STENCIL_WRITEMASK
GL_STEREO
GL_STREAM_COPY
GL_STREAM_DRAW
GL_STREAM_READ
GL_SUBPIXEL_BITS
GL_SUBTRACT
GL_T
GL_T2F_C3F_V3F
GL_T2F_C4F_N3F_V3F
GL_T2F_C4UB_V3F
GL_T2F_N3F_V3F
GL_T2F_V3F
GL_T4F_C4F_N3F_V4F
GL_T4F_V4F
GL_TABLE_TOO_LARGE
GL_TEXTURE
GL_TEXTURE0
GL_TEXTURE1
GL_TEXTURE10
GL_TEXTURE11
GL_TEXTURE12
GL_TEXTURE13
GL_TEXTURE14
GL_TEXTURE15
GL_TEXTURE16
GL_TEXTURE17
GL_TEXTURE18
GL_TEXTURE19
GL_TEXTURE2
GL_TEXTURE20
GL_TEXTURE21
GL_TEXTURE22
GL_TEXTURE23
GL_TEXTURE24
GL_TEXTURE25
GL_TEXTURE26
GL_TEXTURE27
GL_TEXTURE28
GL_TEXTURE29
GL_TEXTURE3
GL_TEXTURE30
GL_TEXTURE31
GL_TEXTURE4
GL_TEXTURE5
GL_TEXTURE6
GL_TEXTURE7
GL_TEXTURE8
GL_TEXTURE9
GL_TEXTURE_1D

GL_TEXTURE_2D
GL_TEXTURE_3D
GL_TEXTURE_ALPHA_SIZE
GL_TEXTURE_BASE_LEVEL
GL_TEXTURE_BINDING_1D
GL_TEXTURE_BINDING_2D
GL_TEXTURE_BINDING_3D
GL_TEXTURE_BINDING_CUBE_MAP
GL_TEXTURE_BIT
GL_TEXTURE_BLUE_SIZE
GL_TEXTURE_BORDER
GL_TEXTURE_BORDER_COLOR
GL_TEXTURE_COMPARE_FUNC
GL_TEXTURE_COMPARE_MODE
GL_TEXTURE_COMPONENTS
GL_TEXTURE_COMPRESSED
GL_TEXTURE_COMPRESSED_IMAGE_SIZE
GL_TEXTURE_COMPRESSION_HINT
GL_TEXTURE_COORD_ARRAY
GL_TEXTURE_COORD_ARRAY_BUFFER_BINDING
GL_TEXTURE_COORD_ARRAY_POINTER
GL_TEXTURE_COORD_ARRAY_SIZE
GL_TEXTURE_COORD_ARRAY_STRIDE
GL_TEXTURE_COORD_ARRAY_TYPE
GL_TEXTURE_CUBE_MAP
GL_TEXTURE_CUBE_MAP_NEGATIVE_X
GL_TEXTURE_CUBE_MAP_NEGATIVE_Y
GL_TEXTURE_CUBE_MAP_NEGATIVE_Z
GL_TEXTURE_CUBE_MAP_POSITIVE_X
GL_TEXTURE_CUBE_MAP_POSITIVE_Y
GL_TEXTURE_CUBE_MAP_POSITIVE_Z
GL_TEXTURE_DEPTH
GL_TEXTURE_DEPTH_SIZE
GL_TEXTURE_ENV
GL_TEXTURE_ENV_COLOR
GL_TEXTURE_ENV_MODE
GL_TEXTURE_FILTER_CONTROL
GL_TEXTURE_GEN_MODE
GL_TEXTURE_GEN_Q
GL_TEXTURE_GEN_R
GL_TEXTURE_GEN_S
GL_TEXTURE_GEN_T
GL_TEXTURE_GREEN_SIZE
GL_TEXTURE_HEIGHT
GL_TEXTURE_INTENSITY_SIZE
GL_TEXTURE_INTERNAL_FORMAT
GL_TEXTURE_LOD_BIAS
GL_TEXTURE_LUMINANCE_SIZE
GL_TEXTURE_MAG_FILTER
GL_TEXTURE_MATRIX
GL_TEXTURE_MAX_LEVEL
GL_TEXTURE_MAX_LOD
GL_TEXTURE_MIN_FILTER
GL_TEXTURE_MIN_LOD
GL_TEXTURE_PRIORITY
GL_TEXTURE_RED_SIZE
GL_TEXTURE_RESIDENT
GL_TEXTURE_STACK_DEPTH
GL_TEXTURE_WIDTH
GL_TEXTURE_WRAP_R
GL_TEXTURE_WRAP_S
GL_TEXTURE_WRAP_T
GL_TRANSFORM_BIT
GL_TRANSPOSE_COLOR_MATRIX
GL_TRANSPOSE_MODELVIEW_MATRIX
GL_TRANSPOSE_PROJECTION_MATRIX
GL_TRANSPOSE_TEXTURE_MATRIX
GL_TRIANGLE_FAN
GL_TRIANGLE_STRIP
GL_TRIANGLES
GL_TRUE
GL_TRUE
GL_UNPACK_ALIGNMENT
GL_UNPACK_IMAGE_HEIGHT
GL_UNPACK_LSB_FIRST
GL_UNPACK_ROW_LENGTH
GL_UNPACK_SKIP_IMAGES
GL_UNPACK_SKIP_PIXELS
GL_UNPACK_SKIP_ROWS
GL_UNPACK_SWAP_BYTES
GL_UNSIGNED_BYTE
GL_UNSIGNED_BYTE_2_3_3_REV
GL_UNSIGNED_BYTE_3_3_2
GL_UNSIGNED_INT

GL_UNSIGNED_INT_10_10_10_2
GL_UNSIGNED_INT_2_10_10_10_REV
GL_UNSIGNED_INT_8_8_8_8
GL_UNSIGNED_INT_8_8_8_8_REV
GL_UNSIGNED_SHORT
GL_UNSIGNED_SHORT_1_5_5_5_REV
GL_UNSIGNED_SHORT_4_4_4_4
GL_UNSIGNED_SHORT_4_4_4_4_REV
GL_UNSIGNED_SHORT_5_5_5_1
GL_UNSIGNED_SHORT_5_6_5
GL_UNSIGNED_SHORT_5_6_5_REV
GL_V2F
GL_V3F
GL_VENDOR
GL_VERSION
GL_VERTEX_ARRAY
GL_VERTEX_ARRAY_BUFFER_BINDING
GL_VERTEX_ARRAY_POINTER
GL_VERTEX_ARRAY_SIZE
GL_VERTEX_ARRAY_STRIDE
GL_VERTEX_ARRAY_TYPE
GL_VERTEX_ATTRIB_ARRAY_BUFFER_BINDING
GL_VIEWPORT
GL_VIEWPORT_BIT
GL_WEIGHT_ARRAY_BUFFER_BINDING
GL_WRITE_ONLY
GL_XOR
GL_ZERO
GL_ZOOM_X
GL_ZOOM_Y
glAccum
glActiveTexture
glAlphaFunc
glAreTexturesResident
glBegin
glBeginQuery
glBindTexture
GLbitfield
glBitmap
glBlendColor
glBlendEquation
glBlendFunc
glBlendFuncSeparate
GLboolean
GLbyte
glCallList
glCallLists
GLclampd
glClear
glClearAccum
glClearColor
glClearDepth
glClearIndex
glClearStencil
glClipPlane
glColor3b
glColor3bv
glColor3d
glColor3dv
glColor3f
glColor3fv
glColor3i
glColor3iv
glColor3s
glColor3sv
glColor3ub
glColor3ubv
glColor3ui
glColor3uiv
glColor3us
glColor3usv
glColor4b
glColor4bv
glColor4d
glColor4dv
glColor4f
glColor4fv
glColor4i
glColor4iv
glColor4s
glColor4sv
glColor4ub
glColor4ubv
glColor4ui

glColor4uiv
glColor4us
glColor4usv
glColorMask
glColorMaterial
glColorSubTable
glColorTable
glColorTableParameterfv
glColorTableParameteriv
glCompressedTexImage1D
glCompressedTexImage2D
glCompressedTexImage3D
glCompressedTexSubImage1D
glCompressedTexSubImage2D
glCompressedTexSubImage3D
glConvolutionFilter1D
glConvolutionFilter2D
glConvolutionParameterf
glConvolutionParameterfv
glConvolutionParameteri
glConvolutionParameteriv
glCopyColorSubTable
glCopyColorTable
glCopyConvolutionFilter1D
glCopyConvolutionFilter2D
glCopyPixels
glCopyTexImage1D
glCopyTexImage2D
glCopyTexSubImage1D
glCopyTexSubImage2D
glCopyTexSubImage3D
glCullFace
glDeleteLists
glDeleteQueries
glDeleteTextures
glDepthFunc
glDepthMask
glDepthRange
glDisable
GLdouble
glDrawBuffer
glDrawPixels
glEdgeFlag
glEdgeFlagv
glEnable
glEnd
glEndList
glEndQuery
GLenum
glEvalCoord1d
glEvalCoord1dv
glEvalCoord1f
glEvalCoord1fv
glEvalCoord2d
glEvalCoord2dv
glEvalCoord2f
glEvalCoord2fv
glEvalMesh1
glEvalMesh2
glEvalPoint1
glEvalPoint2
glFeedbackBuffer
glFinish
glFlush
glFogCoordd
glFogCoorddv
glFogCoordf
glFogCoordfv
glFogf
glFogfv
glFogi
glFogiv
glFrontFace
glFrustum
glGenLists
glGenQueries
glGenTextures
glGetBooleanv
glGetBufferParameteriv
glGetClipPlane
glGetColorTable
glGetCompressedTexImage
glGetConvolutionFilter
glGetConvolutionParameterfv

glGetConvolutionParameteriv
glGetDoublev
glGetError
glGetFloatv
glGetHistogram
glGetHistogramParameterfv
glGetHistogramParameteriv
glGetIntegerv
glGetLightfv
glGetLightiv
glGetMapdv
glGetMapfv
glGetMapiv
glGetMaterialfv
glGetMaterialiv
glGetMinmax
glGetMinmaxParameterfv
glGetMinmaxParameteriv
glGetPixelMapfv
glGetPixelMapuiv
glGetPixelMapusv
glGetPolygonStipple
glGetQueryiv
glGetQueryObjectiv
glGetQueryObjectuiv
glGetSeparableFilter
glGetString
glGetTexEnvfv
glGetTexEnviv
glGetTexGendv
glGetTexGenfv
glGetTexGeniv
glGetTexImage
glGetTexLevelParameterfv
glGetTexLevelParameteriv
glGetTexParameterfv
glGetTexParameteriv
glHint
glHistogram
glIndexd
glIndexdv
glIndexf
glIndexfv
glIndexi
glIndexiv
glIndexMask
glIndexs
glIndexsv
glIndexub
glIndexubv
glInitNames
GLint
glIsBuffer
glIsEnabled
glIsList
glIsQuery
glIsTexture
glLightf
glLightfv
glLighti
glLightiv
glLightModelf
glLightModelfv
glLightModeli
glLightModeliv
glLineStipple
glLineWidth
glListBase
glLoadIdentity
glLoadMatrixd
glLoadMatrixf
glLoadName
glLoadTransposeMatrixd
glLoadTransposeMatrixf
glLogicOp
glMap1d
glMap1f
glMap2d
glMap2f
glMapGrid1d
glMapGrid1f
glMapGrid2d
glMapGrid2f
glMaterialf

glMaterialfv
glMateriali
glMaterialiv
glMatrixMode
glMinmax
glMultiTexCoord1d
glMultiTexCoord1dv
glMultiTexCoord1f
glMultiTexCoord1fv
glMultiTexCoord1i
glMultiTexCoord1iv
glMultiTexCoord1s
glMultiTexCoord1sv
glMultiTexCoord2d
glMultiTexCoord2dv
glMultiTexCoord2f
glMultiTexCoord2fv
glMultiTexCoord2i
glMultiTexCoord2iv
glMultiTexCoord2s
glMultiTexCoord2sv
glMultiTexCoord3d
glMultiTexCoord3dv
glMultiTexCoord3f
glMultiTexCoord3fv
glMultiTexCoord3i
glMultiTexCoord3iv
glMultiTexCoord3s
glMultiTexCoord3sv
glMultiTexCoord4d
glMultiTexCoord4dv
glMultiTexCoord4f
glMultiTexCoord4fv
glMultiTexCoord4i
glMultiTexCoord4iv
glMultiTexCoord4s
glMultiTexCoord4sv
glMultMatrixd
glMultMatrixf
glMultTransposeMatrixd
glMultTransposeMatrixf
glNewList
glNormal3b
glNormal3bv
glNormal3d
glNormal3dv
glNormal3f
glNormal3fv
glNormal3i
glNormal3iv
glNormal3s
glNormal3sv
glOrtho
glPassThrough
glPixelMapfv
glPixelMapuiv
glPixelMapusv
glPixelStoref
glPixelStorei
glPixelTransferf
glPixelTransferi
glPixelZoom
glPointParameterf
glPointParameterfv
glPointParameteri
glPointParameteriv
glPointSize
glPolygonMode
glPolygonOffset
glPolygonStipple
glPopAttrib
glPopClientAttrib
glPopMatrix
glPopName
glPushAttrib
glPushClientAttrib
glPushMatrix
glPushName
glRasterPos2d
glRasterPos2dv
glRasterPos2f
glRasterPos2fv
glRasterPos2i
glRasterPos2iv

glRasterPos2s
glRasterPos2sv
glRasterPos3d
glRasterPos3dv
glRasterPos3f
glRasterPos3fv
glRasterPos3i
glRasterPos3iv
glRasterPos3s
glRasterPos3sv
glRasterPos4d
glRasterPos4dv
glRasterPos4f
glRasterPos4fv
glRasterPos4i
glRasterPos4iv
glRasterPos4s
glRasterPos4sv
glReadBuffer
glReadPixels
glRectd
glRectdv
glRectf
glRectfv
glRecti
glRectiv
glRects
glRectsv
glRenderMode
glResetHistogram
glResetMinmax
glRotated
glRotatef
glSampleCoverage
glScaled
glScalef
glScissor
glSecondaryColor3b
glSecondaryColor3bv
glSecondaryColor3d
glSecondaryColor3dv
glSecondaryColor3f
glSecondaryColor3fv
glSecondaryColor3i
glSecondaryColor3iv
glSecondaryColor3s
glSecondaryColor3sv
glSecondaryColor3ub
glSecondaryColor3ubv
glSecondaryColor3ui
glSecondaryColor3uiv
glSecondaryColor3us
glSecondaryColor3usv
glSelectBuffer
glSeparableFilter2D
glShadeModel
GLshort
GLsizei
glStencilFunc
glStencilMask
glStencilOp
glTexCoord1d
glTexCoord1dv
glTexCoord1f
glTexCoord1fv
glTexCoord1i
glTexCoord1iv
glTexCoord1s
glTexCoord1sv
glTexCoord2d
glTexCoord2dv
glTexCoord2f
glTexCoord2fv
glTexCoord2i
glTexCoord2iv
glTexCoord2s
glTexCoord2sv
glTexCoord3d
glTexCoord3dv
glTexCoord3f
glTexCoord3fv
glTexCoord3i
glTexCoord3iv
glTexCoord3s

glTexCoord3sv
glTexCoord4d
glTexCoord4dv
glTexCoord4f
glTexCoord4fv
glTexCoord4i
glTexCoord4iv
glTexCoord4s
glTexCoord4sv
glTexEnvf
glTexEnvfv
glTexEnvi
glTexEnviv
glTexGend
glTexGendv
glTexGenf
glTexGenfv
glTexGeni
glTexGeniv
glTexImage1D
glTexImage2D
glTexImage3D
glTexParameterf
glTexParameterfv
glTexParameteri
glTexParameteriv
glTexSubImage1D
glTexSubImage2D
glTexSubImage3D
glTranslated
glTranslatef

GLU

GLU_AUTO_LOAD_MATRIX
GLU_BEGIN
GLU_CCW
GLU_CULLING
GLU_CW
GLU_DISPLAY_MODE
GLU_DOMAIN_DISTANCE
GLU_EDGE_FLAG
GLU_END
GLU_ERROR
GLU_EXTENSIONS
GLU_EXTERIOR
GLU_FALSE
GLU_FILL
GLU_FLAT
GLU_INSIDE
GLU_INTERIOR
GLU_INVALID_ENUM
GLU_INVALID_OPERATION
GLU_INVALID_VALUE
GLU_LINE
GLU_MAP1_TRIM_2
GLU_MAP1_TRIM_3
GLU_NONE
GLU_NURBS_BEGIN
GLU_NURBS_BEGIN_DATA
GLU_NURBS_BEGIN_DATA_EXT
GLU_NURBS_BEGIN_EXT
GLU_NURBS_COLOR
GLU_NURBS_COLOR_DATA
GLU_NURBS_COLOR_DATA_EXT
GLU_NURBS_COLOR_EXT
GLU_NURBS_END
GLU_NURBS_END_DATA
GLU_NURBS_END_DATA_EXT
GLU_NURBS_END_EXT
GLU_NURBS_ERROR
GLU_NURBS_ERROR1
GLU_NURBS_ERROR10
GLU_NURBS_ERROR11
GLU_NURBS_ERROR12
GLU_NURBS_ERROR13
GLU_NURBS_ERROR14
GLU_NURBS_ERROR15
GLU_NURBS_ERROR16
GLU_NURBS_ERROR17
GLU_NURBS_ERROR18
GLU_NURBS_ERROR19
GLU_NURBS_ERROR2
GLU_NURBS_ERROR20
GLU_NURBS_ERROR21
GLU_NURBS_ERROR22

GLU_NURBS_ERROR23
GLU_NURBS_ERROR24
GLU_NURBS_ERROR25
GLU_NURBS_ERROR26
GLU_NURBS_ERROR27
GLU_NURBS_ERROR28
GLU_NURBS_ERROR29
GLU_NURBS_ERROR3
GLU_NURBS_ERROR30
GLU_NURBS_ERROR31
GLU_NURBS_ERROR32
GLU_NURBS_ERROR33
GLU_NURBS_ERROR34
GLU_NURBS_ERROR35
GLU_NURBS_ERROR36
GLU_NURBS_ERROR37
GLU_NURBS_ERROR4
GLU_NURBS_ERROR5
GLU_NURBS_ERROR6
GLU_NURBS_ERROR7
GLU_NURBS_ERROR8
GLU_NURBS_ERROR9
GLU_NURBS_MODE
GLU_NURBS_MODE_EXT
GLU_NURBS_NORMAL
GLU_NURBS_NORMAL_DATA
GLU_NURBS_NORMAL_DATA_EXT
GLU_NURBS_NORMAL_EXT
GLU_NURBS_RENDERER
GLU_NURBS_RENDERER_EXT
GLU_NURBS_TESSELLATOR
GLU_NURBS_TESSELLATOR_EXT
GLU_NURBS_TEX_COORD_DATA_EXT
GLU_NURBS_TEX_COORD_EXT
GLU_NURBS_TEXTURE_COORD
GLU_NURBS_TEXTURE_COORD_DATA
GLU_NURBS_VERTEX
GLU_NURBS_VERTEX_DATA
GLU_NURBS_VERTEX_DATA_EXT
GLU_NURBS_VERTEX_EXT
GLU_OBJECT_PARAMETRIC_ERROR
GLU_OBJECT_PARAMETRIC_ERROR_EXT
GLU_OBJECT_PATH_LENGTH
GLU_OBJECT_PATH_LENGTH_EXT
GLU_OUT_OF_MEMORY
GLU_OUTLINE_PATCH
GLU_OUTLINE_POLYGON
GLU_OUTSIDE
GLU_PARAMETRIC_ERROR
GLU_PARAMETRIC_TOLERANCE
GLU_PATH_LENGTH
GLU_POINT
GLU_SAMPLING_METHOD
GLU_SAMPLING_TOLERANCE
GLU_SILHOUETTE
GLU_SMOOTH
GLU_TESS_BEGIN
GLU_TESS_BEGIN_DATA
GLU_TESS_BOUNDARY_ONLY
GLU_TESS_COMBINE
GLU_TESS_COMBINE_DATA
GLU_TESS_COORD_TOO_LARGE
GLU_TESS_EDGE_FLAG
GLU_TESS_EDGE_FLAG_DATA
GLU_TESS_END
GLU_TESS_END_DATA
GLU_TESS_ERROR
GLU_TESS_ERROR1
GLU_TESS_ERROR2
GLU_TESS_ERROR3
GLU_TESS_ERROR4
GLU_TESS_ERROR5
GLU_TESS_ERROR6
GLU_TESS_ERROR7
GLU_TESS_ERROR8
GLU_TESS_ERROR_DATA
GLU_TESS_MAX_COORD
GLU_TESS_MISSING_BEGIN_CONTOUR
GLU_TESS_MISSING_BEGIN_POLYGON
GLU_TESS_MISSING_END_CONTOUR
GLU_TESS_MISSING_END_POLYGON
GLU_TESS_NEED_COMBINE_CALLBACK
GLU_TESS_TOLERANCE
GLU_TESS_VERTEX

GLU_TESS_VERTEX_DATA
GLU_TESS_WINDING_ABS_GEQ_TWO
GLU_TESS_WINDING_NEGATIVE
GLU_TESS_WINDING_NONZERO
GLU_TESS_WINDING_ODD
GLU_TESS_WINDING_POSITIVE
GLU_TESS_WINDING_RULE
GLU_TRUE
GLU_U_STEP
GLU_UNKNOWN
GLU_V_STEP
GLU_VERSION
GLU_VERTEX
gluBuild1DMipmapLevels
gluBuild1DMipmaps
gluBuild2DMipmapLevels
gluBuild2DMipmaps
gluBuild3DMipmapLevels
gluBuild3DMipmaps
GLubyte
gluCheckExtension
gluCylinder
gluDisk
gluErrorString
gluGetString
GLuint
gluLookAt
gluNewQuadric
gluOrtho2D
gluPartialDisk
gluPerspective
gluPickMatrix
gluProject
gluQuadricDrawStyle
gluQuadricNormals
gluQuadricOrientation
gluQuadricTexture
gluScaleImage
GLushort
gluSphere
gluUnProject
gluUnProject4
glVertex2d
glVertex2dv
glVertex2f
glVertex2fv
glVertex2i
glVertex2iv
glVertex2s
glVertex2sv
glVertex3d
glVertex3dv
glVertex3f
glVertex3fv
glVertex3i
glVertex3iv
glVertex3s
glVertex3sv
glVertex4d
glVertex4dv
glVertex4f
glVertex4fv
glVertex4i
glVertex4iv
glVertex4s
glVertex4sv
glViewport
glWindowPos2d
glWindowPos2dv
glWindowPos2f
glWindowPos2fv
glWindowPos2i
glWindowPos2iv
glWindowPos2s
glWindowPos2sv
glWindowPos3d
glWindowPos3dv
glWindowPos3f
glWindowPos3fv
glWindowPos3i
glWindowPos3iv
glWindowPos3s
glWindowPos3sv
Initialization

list->gl-boolean-vector
list->gl-byte-vector
list->gl-double-vector
list->gl-float-vector
list->gl-int-vector
list->gl-short-vector
list->gl-ubyte-vector
list->gl-uint-vector
list->gl-ushort-vector
make-gl-boolean-vector
make-gl-byte-vector
make-gl-double-vector
make-gl-float-vector
make-gl-int-vector
make-gl-selection-record
make-gl-short-vector
make-gl-ubyte-vector
make-gl-uint-vector
make-gl-ushort-vector
OpenGL
OpenGL Vectors
Racket-Style OpenGL
select-buffer->gl-uint-vector
sgl
sgl/bitmap
sgl/gl
sgl/gl-vectors
sgl/init
struct:gl-selection-record
Using OpenGL
vector->gl-boolean-vector
vector->gl-byte-vector
vector->gl-double-vector
vector->gl-float-vector
vector->gl-int-vector
vector->gl-short-vector
vector->gl-ubyte-vector
vector->gl-uint-vector
vector->gl-ushort-vector