1. (3 points) **TRUE** or **FALSE**: The OpenGL command `glPerspective` always produces a projection matrix which maps the origin to a point at infinity in clip-coordinates.

2. (3 points) **TRUE** or **FALSE**: For any values of the parameters $u, v$ between zero and one, the blending functions for a quadric Bezier patch add up to one; that is,
\[
\sum_{i=1}^{3} \sum_{j=1}^{3} B_i(u)B_j(v) = 1
\]

3. (6 points) List the following operations in the order in which they are performed in the graphics pipeline:
   clipping, vertex lighting calculations, texture image lookup, modeling transformations, projection, viewport transformation to pixel coordinates, backface culling.

4. (5 points) The following projection matrix is applied to the 3D vertex $(4.0, 3.0, 2.0)$.
   To what two-dimensional point is the vertex projected?
   
   \[
   \begin{bmatrix}
   1.0 & 0.0 & 0.0 & 0.0 \\
   0.0 & 1.0 & 0.0 & 0.0 \\
   0.0 & 0.0 & 1.0 & 2.0 \\
   0.0 & 0.0 & 1.0 & 0.0
   \end{bmatrix}
   \]

5. (5 pts) What camera motion is accomplished by the following two lines? Describe the motion of the camera.
   
   `glTranslatef(3.0,0.0,0.0);`
   `glRotatef(90,0.0,3.0,0.0);`
6. (5 pts) Here is an OpenGL material specification:

```
glFloat amb [] = {0.3,0.3,0.1,1.0}
glMaterialf(GL_FRONT,GL_AMBIENT,amb);
glFloat diff [] = {0.3,0.3,0.1,1.0}
glMaterialf(GL_FRONT,GL_DIFFUSE,diff);
glFloat spec [] = {0.0,0.0,0.0,1.0}
glMaterialf(GL_FRONT,GL_SPECULAR,spec);
```

Circle the best statement; just pick one. *

a) This would be a good material specification for a shiny yellow taxi cab.
b) This would be a good material specification for a brown tree trunk.
c) This would be a good material specification for a grayish-blue stone wall.
d) This would be a good material specification for a reddish-green brick house.
e) This is a bad material specification; there will be no diffuse lighting effect since the ambient and diffuse colors are the same.
f) This is a bad material specification; the specular highlights will be darker than the rest of the surface instead of brighter.

7. (10 points) A parametric surface is defined as the set of points \((X(u, v), Y(u, v), Z(u, v))\) where

\[
X(u, v) = u \\
Y(u, v) = v \\
Z(u, v) = \sin(v)
\]

Give a formula for the normal vector as a function of the parameter values \((u, v)\).