NAME ____________________________________________________________

Directions:

All answers are to be written on the paper provided. Do all problems.

Problems:

1. What values are necessary to specify a plane in 3-dimensional space? Given a point P, how do I determine if P is a point on a given plane?

2. What is Gouraud Shading?

3. Outline the construction of a Transformation T whose action is to rotate an entity an angle of 30 degrees about the axis specified by the vector <0, -1, -1> and the point (-3, 6, -3). No matrices please, but be specific about the rotation angles.

4. Given the points (0,0), (0,1), (4,3), and (4,0), let P(t) be the Bezier curve defined by these control points. What is P(.5)? Explain how you obtained your answer.

5. The matrix

\[
\begin{pmatrix}
2 & 0 & 0 & 0 \\
0 & 2 & 0 & 0 \\
0 & 0 & 2 & 0 \\
0 & 0 & 11 & 2 \\
\end{pmatrix}
\]

corresponds to what geometric transformation?
6. The two polygons A and B intersect. Outline a procedure that will determine the endpoints of the line of intersection of A and B.

7. In the vertex and fragment shaders what do the following keywords mean when declaring variables: "uniform", "attribute" (or "in" for newer OpenGL versions), and "varying" (or "in"/"out" for newer OpenGL versions)?

8. Assume that you have both positions and normal vectors. What does interleaving mean when you are putting this data into a vertex buffer? What would be an alternative to interleaving?

9. What is the difference between a vertex array object and a vertex buffer object? (This is probably a pretty hard question.)

10. What is the purpose of the following functions from QGLWidget: paintGL, initializeGL, and resizeGL? When do they get called and what type of code do you put in each?