**Final Review**

This is the list of topics that I will pay most attention to in making out the final. Final is on Wed. Dec 10 at 10:30.

1. Review the previous exam review for the meaning of the listed command. I definitely will ask some of these, not necessary those on the last exam.
2. What is an Affine transformation?
3. What are homogeneous coordinates.  How do you convert a homogeneous point such as (1.0,3.0,2.0,2.0) back to 3D?
4. Why are homogeneous coordinates important in graphics.  What is the difference between a point and a vector?  What are the two main operations that combine the vector space with the set of points?
5. What is the difference between glDrawArrays() and glDrawElements().  In both cases what arrays must be sent to the shader and what are their contents.
6. Know how to multiple two mat4′s by hand. Does this operation commute?
7. Know how to multiple a mat4 times a vec4 by hand
8. Give the three homogeneous rotation matrices. (ie mat4)
9. Suppose that I have the operation matricies Translate,Rotate,Scale, and Projection that need to be applied to a vector V.  Write the assignment statement that you would use. Note the order is important.
10. Be sure and be able to explain exactly what the Projection matrix actually does and what the model-view matrix does.
11. Suppose that I have a cube positioned at the point (4,4,4) that has radius 2. Further suppose that I want to spin the cube about its center point (4,4,4). Spin around a line that is parallel to the y axis.  What would I need to multiply times the vertices of this cube to make this happen? Explain
12. Suppose that I have a plane defined by 2x+3y-4z+3=0.  Calculate the distance of the point (4,3,5) from this plane.  Show work and use dot product in your calculations.
13. What is a vao?  a vbo?
14. Explain the ambient, diffuse and specular portions of the Phong Lighting model. Show how the normal is used in these calculations.
15. Explain Blinn’s half-angle modification of the above Phong lighting equation.  Why is this better.  Draw a diagram to support your discussion.
16. How is the source lighting combined with material settings to get the final color?
17. Suppose that in the vertex shader vertex A has color (.2,.4,.6,1.0) and adjacent vertex B has color (.3,.1,.4,1.0).  Suppose that the line segment between A and B appears on the output frame.  What color does the fragment shader color the pixel that is half way between the two points in the frame buffer.  How does this work since there are no actual vertices between A and B in the model?
18. There is a matrix M that can convert a coordinate system of vectors to another system of vectors.  This is also a matrix M’ that can be used to convert vertices in one coordinate system to another coordinate system.  How are M’ and M related.  Explain.
19. Explain the format of an .obj file as we generated blender. Suppose that I have a cube that goes from -.4 to 4 in all three directions.  Give the .obj file for this.
20. Why were we able to draw objects that were inside the default cube (ie -1 to 1 in all three directions) with out using projection() and lookat() matricies. Explain clearly.
21. Explain Gouraud shading and associated shaders.
22. The textbook has an example of a Phong fragment shader.  Make sure you understand the instructions that are applied in this shader.
23. In the vertex shader there are ***in***, ***out*** and ***uniform*** variables.  Explain how each of these type are given their values.
24. Explain how an array of vertices are sent to the shader and connected to a variable, say vPosition.
25. What is a callback function.  Give three examples and when they get called.  Include reshape() in this list.
26. If I were to save a blender cube as an obj what would the face lines look like if it were first converted to smooth shading.  If flat shading?  Explain

I have a few more so this is not completed yet.