EECS-376 Practice Quiz 2

Note: the real quiz will not be anywhere near this long.

Question 1

Describe how to set a breakpoint on Unity using whichever IDE you use.

1. click the left blank part of the line number.

Question 2

Why do we use triangles to model shapes in 3D?

1. can form any polygons;
2. operations are linear;
3. because linear, dot product is one of GPU strength.

Question 3

Here's an equation for the brightness of a pixel given position $\mathbf{r}$ of the patch of surface being imaged, the direction $\mathbf{L}$ of the light ray that's hitting the patch of surface, and the surface normal $\mathbf{n}$ of the patch:

$$brightness = A + B(\mathbf{L} \cdot \mathbf{n}) + C\left(\mathbf{L} - 2\big(\mathbf{n}(\mathbf{L} \cdot \mathbf{n})\big)\right) \cdot \mathbf{r}$$

All vectors here are assumed to be in camera-centered coordinates, and to keep things simple, we're assuming this is just in black and white so the result is one number, a brightness. The three constants A, B, and C control the amount of diffuse, specular, and ambient light. Which one controls which? That is, which of the terms in the above equation are the ambient, diffuse, and specular terms?

$\mathbf{L} \cdot \mathbf{n} = \cos ø$
$\mathbf{L} = \mathbf{L\_n} + \mathbf{L\_t}$
$\mathbf{R} = \mathbf{L\_t} - \mathbf{L\_n} =$
$\mathbf{L} - 2(\mathbf{n}(\mathbf{L} \cdot \mathbf{n})) = \mathbf{R}$

Question 4

If you're displaying a model using Phong shading and a texture map, what information needs to be specified for each vertex, besides its position in space?

Question 5

Why do we have to draw transparent surfaces from back to front?

***alpha blending* is not commutative so different order leads to different result**

Question 6

What is the separating axis theorem? Why do we care?

Question 7

Give a situation in which static collision detection will miss a collision and continuous detection will detect it.

Question 8

What coordinate systems (object, world, camera, and screen) do each of the following matrices map? Give your answers in the form "X coordinates to Y coordinates":

- The projection matrix
- The model matrix
- The view matrix

Question 9

What's a good heuristic function for path planning in 2D?

Question 10

In the Spore behavior tree system, what's the difference between the Decide() function and the Tick() function?

Question 11

Your GPU's frame buffer stores the Z coordinate from which every pixel is imaged. Why?

Question 12

Why is it expensive to switch from one shader to another while rendering?

Question 13

Your friend is making a space flight simulator and is representing 3D position as a combination of translational position and a unit vector in the direction the ship is pointed. Why is this not even a valid representation of 3D pose?

Question 14

What are the disadvantages of rotation matrices as a representation of rotation?