

**ICS 62 – Game Technologies and Interactive Media – Spring, 2015 – Test #2**

Your name in block letters: \_\_\_\_\_

1. (20 points) Consider a 3D scene. In the scene is a triangle mesh model, which happens to consist of a single triangle. The triangle's three vertices have the same color, light blue. The scene also has two ambient lights, one with a dim red color and one with a medium-bright white light. Assume there are no other light sources, and that the mesh surface has no special properties relating to shininess, reflectivity, or texture.

Note: for a, b, and c, use a scale of 0.00-1.00 for RGB values. For d, your final RGB values should be on a 0-255 scale.

- a. Write down a reasonable RGB value for the mesh's vertices.
- b. Write down a reasonable RGB value for the first ambient light.
- c. Write down a reasonable RGB value for the second ambient light.
- d. Using the RGB values from a, b, and c, what is the RGB value of the pixels that the triangle maps to? Show each step of your computation explicitly.
- e. Part d made the assumption that all pixels corresponding to the triangle have the same color. Under what circumstances would this not be the case?

2. (20 points) Many CPUs have one or more “caches” (eg. L1 cache, L2 cache).

What is the problem that a cache is designed to address?

How does the cache at least partially solve this problem?

GPUs (Graphics Processing Units) typically have no or very little cache. How do GPUs at least partially solve the problem you identified above?

What is the characteristic of computer graphics, particularly rendering (turning a triangle mesh, lighting, textures, and other information into pixels), that makes this kind of computation particularly suited to a GPU?

3. (10 points) In computer 3D modeling and animation, what are “bones” and what is their purpose?

4. (10 points) Draw a diagram that gives a simple example of Inverse Kinematics (IK). Draw the diagram carefully and clearly (use the back of this page for scratch, if you want), and label the parts of the diagram. Write a sentence or two that explains the diagram. Your text and diagram should be understandable to someone who isn't familiar with the concept of IK.