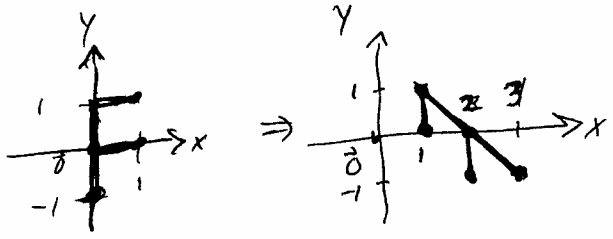
Midterm - CSE 167 - Some Study Problems

This is a few extra problems for review/study, to help prepare for the CSE 167 midterm. You should also review quiz and homework problems. A synopsis of lecture topics can be found on the course web page, to help you review course topics.

No calculators or cheat sheet will be allowed for the midterm.

1) An "F" is affected by an affine transformation A as shown. (a) Give the 3x3 homogeneous matrix that represents A.



(b) What 3x3 matrix represents A^{-1}?

(c) What sequence of pseudo-OpenGL commands could be used to draw the "F" on the right using a routine drawF() that draws the "F" on the left.

(2) When is it preferable to use orthographic viewing transformations? Why? Similarly, when is it preferable to use perspective transformations?

(3) Describe the difference between Phong shading and Gouraud shading. What are their relative advantages?

(4) What are the three kinds (or fewer) of light used in the Phong lighting model. Draw pictures illustrating the different kinds of reflection in the Phong lighting model.

5) Let $\vec{u} = \langle 1,1,1 \rangle$.

Let $\vec{v} = \langle 1,0,0 \rangle$.

What is projection of $\vec{v}$ onto $\vec{u}$?

What is the result $\vec{w}$ of rotating $\vec{v}$ 90° around $\vec{u} = \langle 1,1,1 \rangle$ with direction of rotation given by the right rule?

6) Let $R_{90^\circ,\vec{i}}$ be a 90° rotation around the x-axis (in $\mathbb{R}^3$).

Let $R_{90^\circ,\vec{j}}$ be a 90° rotation around the y-axis.

Give a 3x3 matrix that represents the linear transformation $R_{90^\circ,\vec{j}} \circ R_{90^\circ,\vec{i}}$. Do the same for $R_{90^\circ,\vec{i}} \circ R_{90^\circ,\vec{j}}$.

7) Describe how double-buffering works.

8) Describe "z-fighting".

9) Define the term "aspect ratio"

10) Describe the "painters algorithm" for hidden surface removal.

11) Describe how the depth buffer is used for hidden surface removal.

12) Consider the infinite cylinder $\{\langle x,y,z \rangle : (x+y)^2 + z^2 = 1\}$
The point $\langle 1/\sqrt{2}, -1/\sqrt{2}, 1/\sqrt{2} \rangle$ is on the cylinder. What is the normal vector at this point $\langle 1/\sqrt{2}, 1-1/\sqrt{2}, 1/\sqrt{2} \rangle$?

13) Find a parametric equation for the cylinder, between $x = 0$ and $x = 1$. Use this to find another formula for the normal vectors for points on the cylinder.