

## ECS 175: Computer Graphics

Homework 1 - Spring 2004

Due in class Mon May 3

1. There are many shades of pink. Give two OpenGL `color3f` commands, one to make a bright, hot, day-glo pink, and the other to make a pale, delicate rose.
2. The  $z$  values at any point in a 3D triangle are calculated in the rasterization hardware using linear interpolation. For a 3D triangle with vertices  $(1, 2, 6)$ ,  $(5, 4, 1)$ ,  $(8, 1, 1)$ , what is the  $z$  value which will be found for the point with  $(x, y)$  coordinates  $(5, 3)$ ? In other words, for the point  $(5, 3, z)$ , find  $z$ .
3. Find all two-dimensional vectors which are left fixed by the following affine transformation:

$$\begin{bmatrix} 3 & -1 & 4 \\ -2 & 2 & 6 \\ 0 & 0 & 1 \end{bmatrix}$$

4. Bezier curves can be used to control the path of an animated object. For instance, the parabolic path of a thrown basketball can be described by a quadric Bezier curve. Say we want 10 frames of animation. In frame zero the center of the ball is at  $(0, 0)$ , and in frame 9 its center is at  $(6, 0)$ . To make the ball arc up inbetween, we add a third control point at  $(3, 6)$ . Say we also want to put some spin on the ball, so that in each frame it rotates around its own center by  $\pi/10$ .

Write the matrix for the modeling transformation you would use to place the ball correctly in frame  $i$ . The coefficients in the matrix can be functions of  $i$ , and you do not need to find real values for anything (eg. writing  $\cos(\pi/10)$  is just fine).