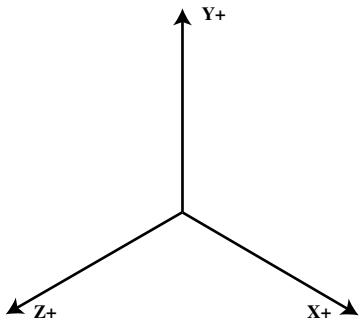
CMSC 23700	**Introduction to Computer Graphics**	**Homework 4**
Fall 2005		**Due November 22**

1. An isometric projection is a parallel projection in which the angles between the projected axes are equal (*i.e.*, 120°) as shown in the following picture.



   Let f be the distance to the far plane and n the distance to the near plane. Assume that $r = 1$, $l = -1$, $t = 1$, and $b = -1$. Define an isometric projection matrix that maps the world-space axes as shown in the picture, with the world-space origin being projected to $x = 0$ and $y = 0$.

2. Assume that we are approximating the circle defined by $x^2 + y^2 - r^2 = 0$ and $z = d$ (in eye space) by a hexagon. If the focal length is e, what is the maximum error in the radius of the approximation in projection-space coordinates.

3. One way to make LOD transitions is to use an α *fade*, where you lerp the α channel to blend the two LODs. Assume that you have a triangle $\langle \mathbf{p}_1, \mathbf{p}_2, \mathbf{p}_3 \rangle$ and a vertex $\mathbf{q}$ that bisects the line $\mathbf{p}_2\mathbf{p}_3$, splitting the triangle into two triangles $\langle \mathbf{p}_1, \mathbf{p}_2, \mathbf{q} \rangle$ and $\langle \mathbf{p}_1, \mathbf{q}, \mathbf{p}_3 \rangle$. Define a function

   ```
   void alphaLerp (float eye[3], float c[3], float t);
   ```

   that takes as arguments the eye position, the triangle's color (`c`), and a parameter $0 \leq \mathtt{t} \leq 1$ that controls the blending of the two images. When `t` is 0, just the single triangle should be drawn, and when `t` is 1, just the triangle pair should be drawn. You may use mathematical notation or C code to write your answer, but it should clearly specify the OpenGL state used in rendering.