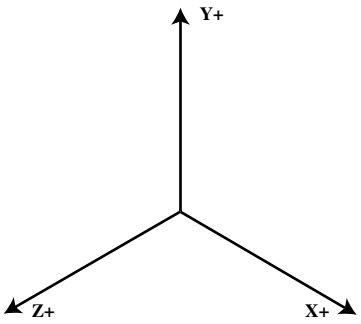
CMSC 23700 **Introduction to Computer Graphics** **Homework 3**
Winter 2008 **Due February 7**

1. Let $\mathbf{M} = \begin{bmatrix} & \mathbf{N} & \\ 0 & 0 & 0 & 1 \end{bmatrix}$ be a 4×4 matrix. Show that $\mathbf{M}\langle x, y, z, 1\rangle^{\mathrm{T}}$ is the same as $\mathbf{M}\langle hx, hy, hz, h\rangle^{\mathrm{T}}$ after homogenization.

2. 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 $y = 0$.

3. 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.