CSCI 480, Fall 2015, Math Homework # 3
Due date: Friday, December 4, midnight

Name_____ Number _____

Typeset this homework using LaTeX. Pictures can be hand drawn, scanned, and included as images (see the jpg below).

1. Express the homogeneous 3D transformation defined by the matrix

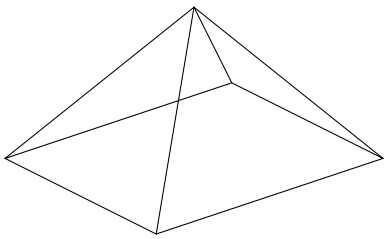
$$\begin{bmatrix} 0 & -1 & 0 & 2 \\ 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

   As a sequence of transformations in the following ways. Express your answer in English as well as two simpler transformation matrices.

   (a) A rotation followed by a translation.

   (b) A translation followed by a rotation.

2. The pyramid shown is represented by the following vertices:



$$\begin{array}{rcl} 0 & : & (0,1,0,0) \\ 1 & : & (1,0,0,0) \\ 2 & : & (0,0,1,0) \\ 3 & : & (-1,0,0,0) \\ 4 & : & (0,0,-1,0) \end{array}$$

   We assume a standard OpenGL frame.

   (a) Give an elements list that describes the top four triangles, being careful to make each of them face outward.

   (b) Give an elements list that describes the bottom square as two triangles, both of which include the point numbered 1. Again, make sure they face outward (in this case, down).

3. The Eiffel tower is 300 meters high. Let's assume that the girl in the picture is 1 meter tall. If the girl is 10 meters from the camera, approximately how far away is the Eiffel tower? Draw pictures to explain your answer.

   If we're going to try to recreate this in OpenGL, and the *near* distance is set to x, what would be good values for the *top* and *bottom* distances? Draw pictures to explain your answer.

4. A camera is placed at $(5,0,0)$ looking at the origin. It's *up* vector is the y axis. What is the camera's *view* matrix?