# CPSC 314 Homework 2


Term: Jan 2008, Instructor: W. Heidrich (for T. Munzner), http://www.ugrad.cs.ubc.ca/~cs314

This home work is due on **Friday, Feb 29, 1pm**. It is worth **4%** of your final course grade.

## 1 Projective Transformation iof Points (10 Points)

Let $P = (1, 0, -3)$ and $Q = (2, 3, 2)$. Suppose the projection matrix has been modified with

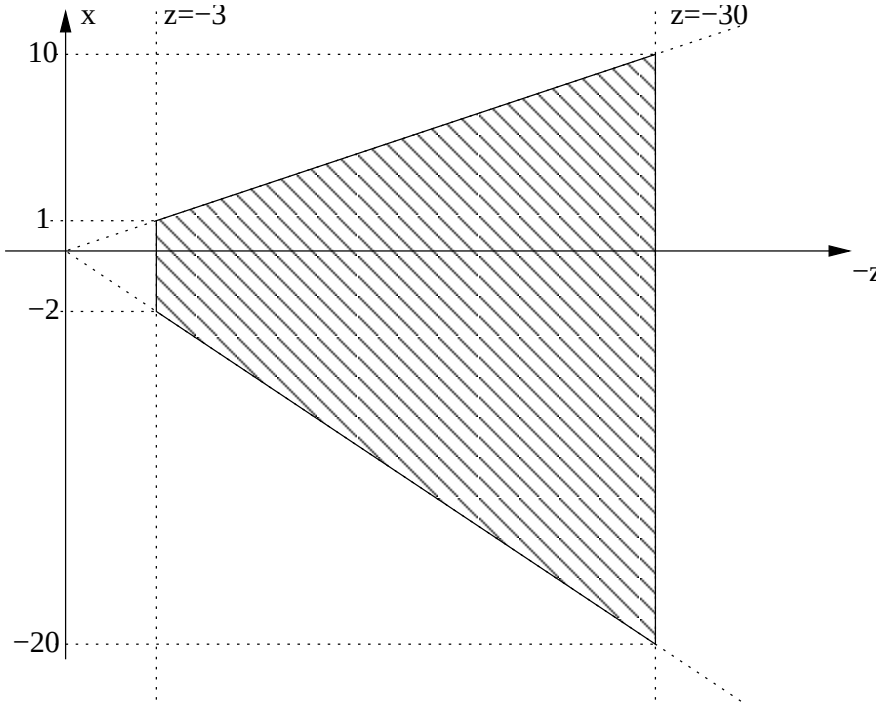
```
glLoadIdentity();
gluPerspective(90.0, 1.0, 1.0, 100.0);
```

and that the modelview matrix is unchanged from its default setting. To which points (in normalized device coordinates) are P and Q transformed? Show your work by first indicating the frustum produced by the gluPerspective() call.

## 2 Perspective Transformation in 2D (20 Points)

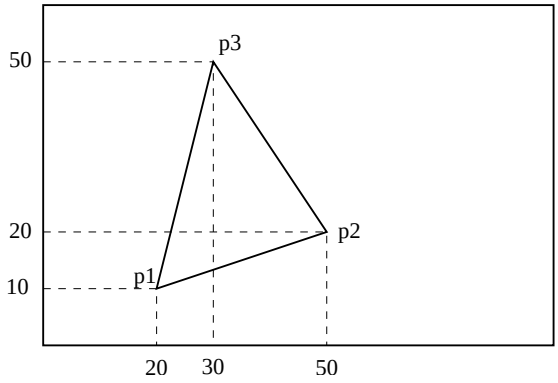
a) In class, you learned that you need to specify the mapping of 5 points in general position to uniquely describe a 3D perspective transformation. How many points are required if we restrict ourselves to 2D?

b) Derive the $3 \times 3$ homogeneous matrix that maps the asymmetric view frustum drawn below into the square with corners at $(-1,-1)^T \ldots (1,1)^T$.



# 3 Scan Conversion (20 Points)

a) Derive the **edge equations** for scan-converting the triangle given in device/pixel coordinates below. Pay attention to the sign of the equations, so that positive values correspond to the inside of the triangle.




b) Derive the **plane equation** for interpolating some property $c$ across the triangle. The values at the vertices are $c_1 = 0$, $c_2 = 1$, and $c_3 = 2$, respectively. You don't need to solve any equation systems that may arise.