CMSC427 Midterm practice questions

1. Give code plus the openGL vertex calls needed to draw the following parametric curve, given the appropriate variables t and R. $P(t) = (t \cos 2\pi t, \sin 2\pi t, 2t)$

2. Compute the Frenet frame for the parametric curve $p(t) = < t^3, t, \sin t >$
Don't normalize for this exercise.

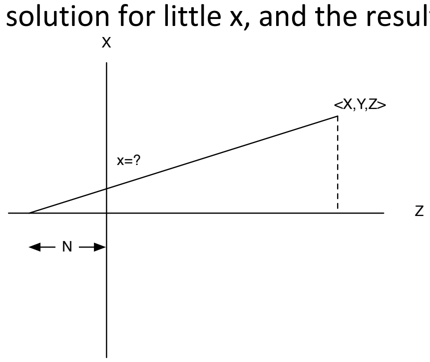
3. Which of the following pairs of transformations do *not* commute?

A. Non-uniform scale and rotation in 2 or 3D.

B. Two rotations around the origin in 2D.

C. Two general rotations in 3D.

4. From this diagram set up the perspective equation for *x.* Here N is the offset of the eye point back from the origin – useful if you'd like to take the eye point to negative infinity to see what happens. The image plane is the X axis. Give the similar triangle equation, the perspective solution for little x, and the resulting matrix. (This is similar to previous homework).



5. Given the input data below, compute the camera coordinate system xc, yc and zc, and the camera matrix.

eye = (1,0,0) lookAt = (0,0,0) up = < 0, 1, 0>

6. If there is no rotation in the position of the camera, how does the camera matrix relate to the input values of at, lookAt and up?

7. What is the difference between facet and true normals, and why we assign normals to each vertex rather than each face?

8. Given the following 2D curve in the x-y plane, give the parametric surface of revolution around the y-axis.

$$P(u) = \left\langle \; \sin 2\pi u \quad u^2 + 1 \quad 0 \; \right\rangle$$

9. *Shading models*. What is the effect of increasing f in the shading equation (the exponent for the specular component?

10. Given the following data:

p1 = (1,0,0)	p4 = (2,0,2)	Ia = 100	rho_a = 0.2
p2 = (0,0,1)	eye = (2,2,0)	Id = 80	rho_d = 0.5
p3 = (0,1,0)	f = 2	Is = 40	rho_s = 0.5

Compute the geometric elements (s,m,r,v) for vertex p1.

Compute the ambient, diffuse and specular components

Compute the final value of I.