CS 3014 Computer Graphics
Exam #2 November 12, 2009 Name:

---

1) Normalize the vector <1 -2 0.5>

2) Given the 2D vectors <2, 3> and <-3, 1>
a) Sketch the vectors

b) Calculate the angle between them

c) Based on your answer to part b, is the angle *acute*, *obtuse*, or *right*?

3) What is the vector that begins at point **(4,2,1)** and ends at point **(5,8, -3**)?

4) Given two vectors **A** and **B** where A = < 3 1 -1 > and B = < -4 2 5>, what is 2A + B?

5) What is the *homogeneous* representation of
a) Point P = (x,y,z)?

b) Vector **p** = <x, y, z> ?

6) Find the transformed image `Q` of point `P = (1,2,3)` if the transformation matrix is given by

```
[3 0 5 0
-2 1 2 0
 0 0 1 0
 0 0 0 1]
```

7) What is the homogeneous scaling matrix M if you wish the make the 3D object twice as wide and one-third as tall as it is now?

8) Assume you have created a glutWireCube of size 1, centered about the origin. Give the values you would use in *gluLookAt* if you wanted to view the cube

a) from the front

b) from the right side

c) from the top

d) slightly *to the right of center and above, looking at the origin.*

9) What would be the calls to **draw the cube** from the previous problem after it has been *translated to the right 7 units, and then rotated by 90 degrees with respect to the z-axis?*

10) The ModelView matrix is actually the produce of two matrices, VM.

a) Give an example of an openGL call that will cause a change in the M part of the matrix.

b) Give an example of an openGL call that will cause a change in the V part of the matrix.

11) What are two advantages to using Newell's Algorithm instead of the cross product to find the normal to a face?

12) If the eye (camera) is at (4,4,4), the lookat point is (0,1,0), and the original **up** direction for the camera is **<0 1 0>**, find the following values for the UVN coordinate system attached to the camera:

a) **n**
b) **u**
c) **v**

Note: there is no need to normalize each.

Or, you may attach your homework that you did for this problem.

13) Either use Newell's method to find the **normal vector** for the polygon having vertices (1,1,2), (2,0,5), (5,1,4), and (6,0,7), or attach your homework problem week8-3.

14) Attach your Critical Assignment for Week 7.