

# Homework 1

## CSCI-4967: Three-Dimensional Computer Graphics

### Fall 2004

Due: Thursday, September 9, 2004

Homeworks are due at the **beginning** of lecture on Thursday, September 9. **Late homeworks will receive no credit.** Homeworks are to be done individually and will be graded on the basis of correctness, clarity, and legibility. Show the steps in your work where appropriate.

Be sure to write your **name** and **RPI email address** on your homework submission.

1. (**10 points**) Look at the *shapes* tutorial that is part of Nate Robins' OpenGL tutorial (available at [www.xmission.com/~nate/tutors.html](http://www.xmission.com/~nate/tutors.html)) to understand how to specify line segments (and other geometric primitives) in OpenGL. Modify the parameters of the line segments in the tutorial and hand in a printout of a screen shot.
2. (**15 points**) Write an OpenGL program to display the initials of your name using line segments. (You may use other geometric primitives if you wish.) Print out and hand in a screen shot of your drawing, as well as your program. You may use the file `hi.cpp`, available on the course web page, to get started.
3. (**5 points**)
  - (a) List three geometric primitives supported by OpenGL.
  - (b) In OpenGL, when might you need to draw a polygon using triangles rather than the polygon primitive?
4. (**10 points**) Consider a raster system with a resolution of 1280 by 1024. If we want to store 32 bits per pixel in the frame buffer, how much storage (in megabytes) do we need for the frame buffer? If the display controller refreshes the screen at a rate of 60 frames per second, what is the required memory bandwidth for the system (in megabytes/second)? What is the refresh time per pixel (in nanoseconds) at 60 frames per second?
5. (**10 points**) Assuming that a certain full-color (24 bit per pixel) RGB raster system has a 2048 by 2048 frame buffer, how many distinct color choices (intensity levels) would we have available? How many different colors could we display at any one time? If 20 megabytes/second can be transferred, how much time (in seconds) will it take to load the frame buffer? What would the maximum frame rate (frames per second) be in this case?