Dr. Wolfe MATH 241 MATLAB PROJECT #1 Due February 17, 2009

This project is to be done with MATLAB, and you should hand in your printed output. Use the **diary** command to save your work. Edit the saved file to include your name, the problem numbers, and the answers to any questions asked in the problems. Then print your file. For further information on MATLAB, consult the introduction posted on the class website. Whenever you use a new MATLAB command learn about it by using the **help** command; *e.g.*, type **help cross** to learn about the **cross** command.

Go to http://www.math.umd.edu/~jec/matcomp/matcompmfiles/mfiles.html and download the entire set of m-files into the directory which which you use as the home directory for your MATLAB work

1. Enter $\mathbf{P0} = [2\ \ 4\ \ 7]$ and $\mathbf{P1} = [1\ \ -1\ \ 7]$ at the >> prompt. Then enter (one at a time) $\mathbf{P0} + \mathbf{P1}, \mathbf{P0} - \mathbf{P1}, (3 * \mathbf{P1} - \mathbf{P0})/4, a = \text{dot}(\mathbf{P0}, \mathbf{P1}), \mathbf{B} = \text{cross}(\mathbf{P0}, \mathbf{P1}), \text{norm}(\mathbf{P0})$ In each case explain the output.

2. With **P0** and **P1** as in Problem 1, find:
   (a) The length of the projection of **P1** on **P0**. (Use the command **abs**).
   (b) An equation of the plane passing through $\mathbf{P0}, \mathbf{P1}$ and **P2** where $\mathbf{P2} = (1, 2, 3)$.

3. Here we will use the command **plane** which you downloaded. Do:
   $>> P = [2\ \ 3\ \ -1];$
   $>> N = [-4\ \ 1\ \ 2];$
   $>> \text{plane}(P, N)$
   Explain and print out the picture you obtain.

4. Run the following script and print out and explain the picture you obtain.
   $P0 = [0\ \ 0\ \ 0];$
   $N1 = [-2.5\ \ 2\ \ 1];$
   $N2 = [2\ \ 1\ \ 1];$
   $\text{plane}(P0, N1)$
   hold on
   $\text{plane}(P0, N2)$
   $L = \text{cross}(N1, N2);$
   $\text{arrow3}(P0, L)$
   $\text{view}(68, 30)$
   hold off

Note: Your graphs will not be saved by the use of the **diary** command. The command **print** will cause the current graphics window to be printed at your default printer. Also, learn how to use the **title** command to title your graphs.

Use MATLAB to do the following problems. Note that they can easily be done by hand.

5. Find a unit vector in the direction of (1, −3, 5).

6. Find an equation of the plane which contains the lines

$$\frac{x-2}{4} = \frac{y-3}{5} = \frac{z+2}{3} \text{ and } \frac{x}{2} = \frac{y+2}{3} = z+1.$$

7. Find the distance between the point (1, 3, 1) and the plane $3(x-2)+2(y-1)-3(z-1) = 0$.

8. Find the area of the triangle with vertices (3, 1, 0), (1, 2, 3) and (0, −1, −2).

9. Find the angle (in radians) between the vectors (2, −2, 4) and (4, −1, 5). Note: In MATLAB the function $\cos^{-1} x$ is **acos**(x).