MA351 Fall 2008 **Extra Credit Project** Name:

Due on Monday, November 10: this will replace a lower score on a past or future project.

Resources:

- The MATLAB website (found on Blackboard and class website) and resources listed there.
- As usual, the files found in the H-drive. In particular, the files in the `PlotExamples` directory have comments explaining some of the commands you can use to plot surfaces in 3D.
- Any of the Chapter 14 files on the H-drive.
- TIP: save these to your own drive and change/experiment with them to learn how some of the commands work.

Instructions: Complete the problems listed on the back on your own sheet(s) of paper. Graphs should have appropriate views with titles and axes clearly labeled (not handwritten); points will be taken off otherwise. **You may not ask other students for help on these problems, although you may ask for my help.**

TO TURN IN:

1. This sheet, on top and stapled to the hand-written work for each of the problems (turned in at the beginning of class), written neatly.
2. The script files and JPG files, emailed to me with the subject line "MA351 EC PROJECT"

POINT SYSTEM:
The project is out of a total of 15 points. Each problem is worth 4 points. In addition, I will appoint one point for the additional specifications and directions (must do all of it to receive the point):

_____/ 4 points	Problem 1: §13.1, #33*
_____/ 4 points	Problem 2: §13.2, #32
_____/ 4 points	Problem 3: §13.4, #16
_____/ 1 point	Files sent appropriately (with correct filenames, filetypes, etc.) Work turned in is neat and stapled.
_____/ 1 point	Script files are commented and run correctly to generate the graphs without extraneous output in the command window. The first line of each script file should be a comment with your name, EC Project and the problem.
_____/ 1 point	Graphs have appropriate domains, views, titles and the axes are appropriately labeled.

_____/ TOTAL

1. From the book, section 13.1 #33* (formulas are changed from book). Show on paper that the graph of the parametric equations

$$x = 3\cos t\sqrt{1+\cos(5t)}$$
$$y = 3\sin t\sqrt{1+\cos(5t)}$$
$$z = -4\sqrt{1+\cos(5t)}$$

is a space curve that lies on a cone. Also state what the equation is for that cone. Make 2 different graphs. The first one is the graph of just the space curve (careful! what would be an appropriate domain for t?). The second one is with the space curve in black and thicker, plus the graph of the bottom-half of the cone. The domain for x and y for the cone should be defined as

```
u=linspace(0,2*pi);
v=linspace(0,5);
[t,r]=meshgrid(u,v);
x=r.*cos(t);
y=r.*sin(t);
```

On paper, solve your equation for the cone for z (show work!) to get an equation for the bottom-half of the cone. In MATLAB, after the code above, define `z` according to your equation (using component-wise computations!). Then graph the cone with the command `mesh(x,y,z)`. Make sure to use the `hold on` and `hold off` commands correctly and that you rotate your graphs before you save them to show a decent view. Save your graphs as JPG files called `ProjEC_1aLastname.JPG` and `ProjEC_1bLastname.JPG`. Save your script files that create these as `ProjEC_1aLastname.m` and `ProjEC_1bLastname.m`, respectively.

2. From the book, section 13.2, #32. Show all work on your paper to find the point of intersection. Also, find the parametric equations of the tangent lines to $\mathbf{r}_1$ and $\mathbf{r}_2$ at that point, and show all work to find the angle of intersection. Make your answers clear. Graph the curves $\mathbf{r}_1$ and $\mathbf{r}_2$ and make them red and blue, respectively. The tangent lines should be dotted and the same color as the respective curves (for example, green dotted would be `'g:'`). The point of intersection should be marked with a black "x" (you may need to make the x bigger). Also, your endpoints for the domains for the curves and lines should be only one unit in either direction from where the point occurs. For example, if the intersection occurs at $t = 6$ for curve 1, have your domain for curve 1 be from 5 to 7. Make sure you maximize your graph window and rotate if necessary before you save it to show a decent view. Save your graph as a JPG file called `ProjEC_2Lastname.JPG` and the script file to create it should be called `ProjEC_2Lastname.m`

3. From the book, section 13.4, #16. Show all work on your paper to find $\mathbf{r}(t)$ and graph it for $0 \le t \le 10$. The graph should be saved as a JPG file called `ProjEC_3Lastname.JPG`. Save the script file to create it and call it `ProjEC_3Lastname.m`.