## What to Submit:

For this project you will need to turn in a printout of what you typed into Matlab and the printouts of the plot windows for those questions asking you to plot.

For the eager: If you know how to publish an m-file you can put all the commands in the m-file and print out the published html document instead if you wish for +5 bonus points.

- 1. Clear Matlab completely with clear all.
- 2. Define the symbolic variables x and t.
- 3. Set t to be a real variable.
- 4. Add 10 and 17.
- 5. Factor the polynomial  $x^5 3x^4 + x^3 + 5x^2 6x + 2$ .
- 6. Solve the equation  $x^2 + 4x 1 = 0$ .
- 7. Differentiate the function  $f(x) = \frac{x^2}{x-1} + \cos(x^2)$ .
- 8. Differentiate the function  $f(x) = xe^{2x-1}$  and then plug in -1.
- 9. Integrate  $f(x) = x^2 + x\cos(x)$ .
- 10. Find the area under the graph of  $f(x) = 9 x^2$  and above the x-axis.
- 11. (a) Define the vectors  $\bar{a} = 3\hat{i} + 2\hat{j} \hat{k}$  and  $\bar{b} = \hat{i} + 3\hat{j} + 2\hat{k}$ .
  - (b) Find the projection of  $\bar{a}$  onto  $\bar{b}$ .
  - (c) Find a unit vector perpendicular to both  $\bar{a}$  and  $\bar{b}$ .
  - (d) Find the sine of the angle between  $\bar{a}$  and  $\bar{b}$ .
- 12. Define four points P = (2, -1, 3), Q = (0, 7, 9), R = (4, -9, -3) and S = (7, -6, -6) and then with two subtractions and one dot product all on one Matlab line show that the line through P and Q is perpendicular to the line through R and S.
- 13. Define two points P = (1, -2, 3) and Q = (2, -1, 3) and one vector  $\bar{n} = 2\hat{i} + 2\hat{j} + 3\hat{k}$  and then with one subtraction and one dot product all on one Matlab line show that Q is not contained in the plane containing P and normal to  $\bar{n}$ .
- 14. Define four points P = (5, 0, 2), Q = (1, 1, 1), R = (0, 1, -2) and S = (1, -2, -1) and then with five subtractions, two cross products and one dot product all on one Matlab line find the distance from S to plane containing the other three points.
- 15. (a) Define the vector valued function  $\bar{r}(t) = \cos(t) \hat{i} + \cos(t) \hat{j} + \sqrt{2}\sin(t) \hat{k}$ .
  - (b) Find the tangent vector  $\overline{T}(t)$ .
  - (c) Find the acceleration vector  $\bar{r}''(\pi/4)$ .
- 16. Plot each of the following. For (b)-(e) make sure that you set the view as I did in the tutorial.
  - (a) The function  $f(x) = (x-2)^2(x-3)^2$ .
  - (b) The vector valued function  $\bar{r}(t) = \sin(t) \hat{i} + t \hat{j} + \cos(t) \hat{k}$  with  $0 \le t \le 10\pi$ .
  - (c) The line segment joining (1, -1, 0) and (-5, 6, 10). Hint: What's the VVF?
  - (d) The plane x + y + 3z = 9.
  - (e) The plane y + 4z = 10.