Matlab Project 1 Tim Pilachowski's sections

Turn in a printout of what you typed into Matlab and the printouts of the plot windows for those questions asking you to plot. The due date is provided on the course schedule.

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 15 and 21.
5. Factor the polynomial $x^5 - 3x^4 + x^3 + 5x^2 - 6x + 2$.
6. Solve the equation $x^2 - 6x = 2$.
7. Differentiate $f(x) = \dfrac{x^2}{x+1} + \sin\left(x^2\right)$.
8. Differentiate $g(x) = xe^{3x}$ then find $g'(-1)$.
9. Integrate $h(x) = x^4 - x\sin x$.
10. Find the area under the graph of $m(x) = 6 - x^2$ and above the *x*-axis.

11a. Define the vectors $\vec{a} = 2\vec{i} + \vec{j} - 3\vec{k}$ and $\vec{b} = 3\vec{i} + \vec{j} + 2\vec{k}$.

b. Find the projection of $\vec{a}$ onto $\vec{b}$.

c. Find a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$.

d. Find the sine of the angle between $\vec{a}$ and $\vec{b}$.

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 $\vec{n} = 2\vec{i} + 2\vec{j} + 3\vec{k}$ 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 $\vec{n}$.

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.

15a. Define the vector valued function $\vec{r}(t) = \sin t\,\vec{i} + \sin t\,\vec{j} + \sqrt{2}\cos t\,\vec{k}$.

b. Find the tangent vector $\vec{T}(t)$.

c. Find the acceleration vector $\vec{r}''\left(\frac{\pi}{4}\right)$.

16. Plot each of the following. Set the view so that we can see all significant features.

a. The function $f(x) = (x+1)^3(x-3)^2$.

b The vector valued function $\vec{r}(t) = \cos t\,\vec{i} + t\,\vec{j} + \sin t\,\vec{k}$ for $0 \le t \le 8\pi$.

c. The line segment joining (1,−1, 1) and (−2, 3, 4). Hint: Write this line segment as a vector-valued function.

d. The plane *x* + 2*y* + 3z = 11.

e. The plane *x* + 2y = 5.