Problem Set 8: Part 1

Problem 1

Plot the function $f(x) = x^3 - 2x^2 - 10sin^2x - e^{0.9x}$ and its derivative for $-x \leq x \leq 4$ in one figure. Plot the function with a solid line, and the derivative with a dashed line. Add a legend and label the axes.

Problem 2

Use the ***fplot*** command to plot the function $f(x) = (sin2x + cos^2 5x)e^{0.2x}$ in the domain $-6 \leq x \leq 6$.

Problem 3

Plot the function $f(x) = sin^2(x)cos(2x)$ and its derivative, both on the same plot, for $0 \leq x \leq 2\pi$. Plot the function with a solid line, and the derivative with a dashed line. Add a legend and label the axes.

Problem 4

A parametric equation is given by $x = sin(t)cos(t)$, $y = 1.5cos(t)$ Plot the function for $-\pi \leq t \leq \pi$. Format the plot such that the both axes will range from -2 to 2.

Problem 5

Two parametric equations are given by:

$$x = cos^3(t),\ y = sin^3(t)$$

$$u = sin(t),\ v = cos(t)$$

In one figure, make plots of y versus x and v versus u for $x \leq t \leq 2\pi$. Format the plot such that the both axes will range from -2 to 2.

Problem 6

Plot the function $f(x) = \frac{x^2-5x-12}{x^2-x-6}$ in the domain $-1 \leq x \leq 7$. Notice that the function has a vertical asymptote at x = 3 . Plot the function by creating two vectors for the domain of x. The first vector (name it x1) includes elements from -1 to 2.9, and the second vector (name it x2) includes elements from 3.1 to 7. For each x vector create a y vector (name them y 1 and y2) with the corresponding values of y according to the function. To plot the function make two curves in the same plot (y1 vs. x1, and y2 vs. x2). Format the plot such that they-axis ranges from -20 to 20.

Problem 7

The following data gives the approximate population of the world for selected years from 1850 unti1 2000.

Year	1850	1910	1950	1980	2000	2010
Population (billions)	1.3	1.75	3	4.4	6	6.8

Figure 1:

The population P, since 1900 can be modeled by the logistic function: $P = \frac{11.55}{1+18.7e^{-0.0193t}}$ where P is in billions and t is years since 1850. Make a plot of population versus years. The figure should show the information from the table above as data points and the population modeled by the equation as a solid line. Set the range of the horizontal axis ftom 1800 to 2200. Add a legend, and label the axes.

Problem 8

The demand for water during a fire is often the most important factor in the design of distribution storage tanks and pumps. For communities with populations less than 200,000, the demand Q (in gallons/min) can be calculated by:

$$A = 1020\sqrt{P}\,(1 - 0.01\sqrt{p})$$

where P is the population in thousands. Plot the water demand Q as a function of the population P (in thousands) for $0 \leq P \leq 200$. Label the axes and provide a title for the plot.