Make sure to write down your procedure clearly and answer exactly what the problem is asking for. Points will be taken off for incomplete, unintelligible, and sloppy procedures and solutions. Include comments in all MATLAB programs.

Follow the five step problem solving in engineering and science whenever required: **1)** State the problem, **2)** Describe the inputs and outputs, **3)** Develop a Hand Example, **4)** Develop a MATLAB solution, and **5)** Test the solution. Graphs are often useful ways to check your calculations.

(20 points) 5.3 Plot the following functions on the same graph for x values from $-\pi$ to π, selecting spacing to create a smooth plot:

$y_1 = \sin(x)$
$y2 = \sin(2x)$
$y3 = \sin(3x)$

(20 points) 5.15 Create a vector of angles form 0 to 2π. Ue the polar plotting function to create graphs of the functions that follow. Remember, polar plots expect the angle and the radius as the two inputs to the polar function. Use the subplot function to put all four of your graphs in the same figure.

(a) $r = \sin^2(\theta) + \cos^2(\theta)$
(b) $r = \sin(\theta)$
(c) $r = e^{\theta/5}$
(d) $r = \sinh(\theta)$

(20 points) 5. 17 When interest is compounded continuously, the following equation represents the growth of your savings:

$$P = P_{0e}^{rt}$$

In this equation,

P = current balance
P_0 = initial balance
r = growth constant, expressed as a decimal fraction
t = time invested

Determine the amount in your account at the end of each year if you invest $1000 at 8% for 30 year (Make a table.)

Create a figure with four subplots. Plot time on the x-axis and current balance P on the y-axis.

(a) In the first quadrant, plot t versus P in a rectangular coordinate system.
(b) In the second quadrant, plot t versus P, scaling the y-axis logarithmically.
(c) In the third quadrant, plot t versus P, scaling the y-axis logarithmically.
(d) In the fourth quadrant, plot t versus P, scaling both axes logarithmically.

(20 points) 5.24 Use the randn function to create 1000 values in a normal (Gaussian) distribution of numbers with a mean of 70 and a standard deviation of 3.5. Create a histogram of the data set you calculated.

(20 points) 5.26 If the equation modeling the vertical distance traveled by a projectile as a function of time is

$$\text{Vertical}(t) = tV_0\sin(\theta) - 0.5gt^2$$

Then, from calculus, the velocity in the vertical direction is

$$\text{Velocity}(t) = V_0\sin(\theta) - gt$$

Create a vector t form 0 to 20 s, and calculate both the vertical position and the velocity in the vertical direction, assuming a launch angle of θ of $\pi/4$ radians and an initial velocity of 100 m/s. Plot both quantities on the same graph with separate y-axes. Be sure to label both y-axes.