ENG1060: COMPUTING FOR ENGINEERS

PASS 2 – Week 4

2020 OCT NOV

TASK 1

Consider the following equations for $-1 \le x \le \pi$

$$y_1 = x\sin(x)\cos(e^{-x})$$
$$y_2 = \cos(x)\sin(e^{-x})$$

Plot y_1 against x as a blue line and plot y_2 against x as a red line on the same figure. Ensure you label your axis and provide a legend.

TASK 2

Here are some wind tunnel data for force (*F*) versus velocity (*v*):

***v* (m/s)**	10	20	30	40	50	60	70	80
***F* (N)**	25	70	380	550	610	1220	830	1450

This data is approximated by the following fitted function:

$$F = 0.2741v^{1.9842}$$

Use MATLAB to create a plot displaying both:

- The experimental data using diamond symbols
- The function using a dotted line for *v*=0 to 90m/s with a resolution of 5m/s.

Ensure you label your plot and include a legend.

TASK 3

Consider the two functions below.

$$f(z) = \frac{1}{\sqrt{2\pi}}e^{-z^2/2}$$

$$g(z) = \frac{z}{6}\sin(z)$$

1. In a 2-by-1 subplot, plot $f(z)$ between $z = -10$ to $z = 10$ with increments of 0.1 as a blue dashed line in the top panel. Determine the maximum $f(z)$ and mark this point as a black square. Remember to label your plot and include a legend. Turn the grid on.
2. In the bottom panel, plot $g(z)$ as a red continuous line using the same *z* defined above. Turn the grid on.

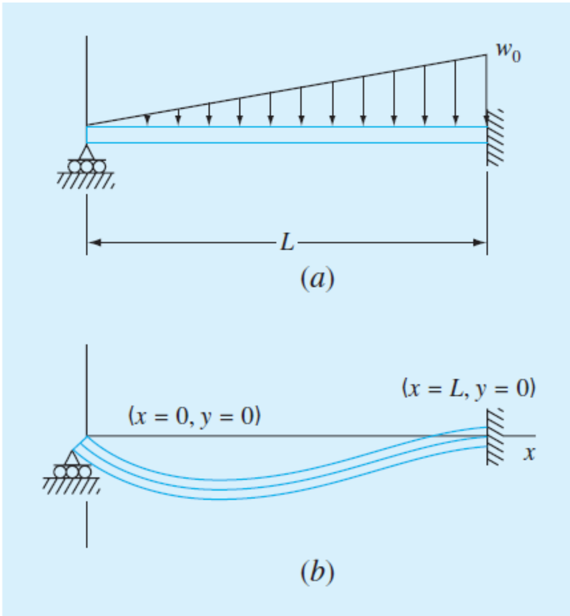
TASK 4

A uniform beam is subjected to a linearly increasing distributed load as shown in panel (a) of the figure below. Panel (b) illustrates the resultant deflection of the beam. Assume the following:
L = 1m, E=50,000 kN/cm^2, I=30,000 cm^4, w_0 = 2500 N/cm.

- Calculate the deflection y at 30 x locations equally spaced between x=0 and x=L. The equation for the deflection is given below. Plot the result of x against y and label your plot.
- Determine the value of the largest deflection and the location of the largest deflection.

Note: Ensure that the units are consistent.

$$y = \frac{w_0}{120EIL}(-x^5 + 2L^2x^3 - L^4x)$$



TASK 5

The horizontal (s_x) and vertical (s_y) displacement of a projectile are

$$s_x = v_o t \cos\theta$$
$$s_y = v_o t \sin\theta - \frac{1}{2}gt^2$$

where t is the time, v_o is the initial projectile velocity, θ is the angle of the projectile from the horizontal and g is 9.8m/s^2.

Let $v_o = 20$m/s, plot the projectile motion for $\theta = 15°, 30°, 45°, 60°, 75°$ on the same figure, with s_x as x-axis and s_y as y-axis. Use t from 0 to 20 seconds. Use legend to label each projectile. For all cases, assume $s_y = 0$ is the ground thus you do not have to plot regions where the vertical displacements are negative. Don't forget axes labels and title.

Hint: Use regular matrix multiplication
Hint: If inputs to plot() are 2D matrices, MATLAB takes each column as separate inputs