2MTRE 2610 – Intermediate Programming for Mechatronics

Homework – Python Plotting

1. Plot the function

$$y = 2\sin(x) - 3\cos(2x)$$

on the domain $0 \le x \le 2\pi$. Format the plot so that the line is black with a linewidth of 4 and it has black triangular markers of size 15 at intervals of $\pi/8$. Be certain to use a sufficient number of points so that the line appears smooth. Adjust the axis to fit the domain and range exactly. Also, display the x positions where the two peaks appear by searching through the y values.

2. Beams experience a normal stress of

$$\sigma = -\frac{M_z y}{I_z} + \frac{M_y z}{I_y} \tag{1}$$

due to the bending moment M where

$$M_y = -M\cos 45° \text{ and } M_z = -M\sin 45°$$

are the y- and z-components of M respectively, and $I_y = 736$ cm^4 and $I_z = 1584$ cm^4 for the given geometry. Use `np.meshgrid` to define the domain and generate a surface plot of the normal stress. Be sure to remove the area inside the channel from the graph by detecting where the hole is rather than hard-coding index numbers. Specify the `figsize` input argument to `matplotlib.pyplot.figure` to make the axis aspect ratio match the horizontal and vertical scale. Finally, label axes and include units as appropriate.