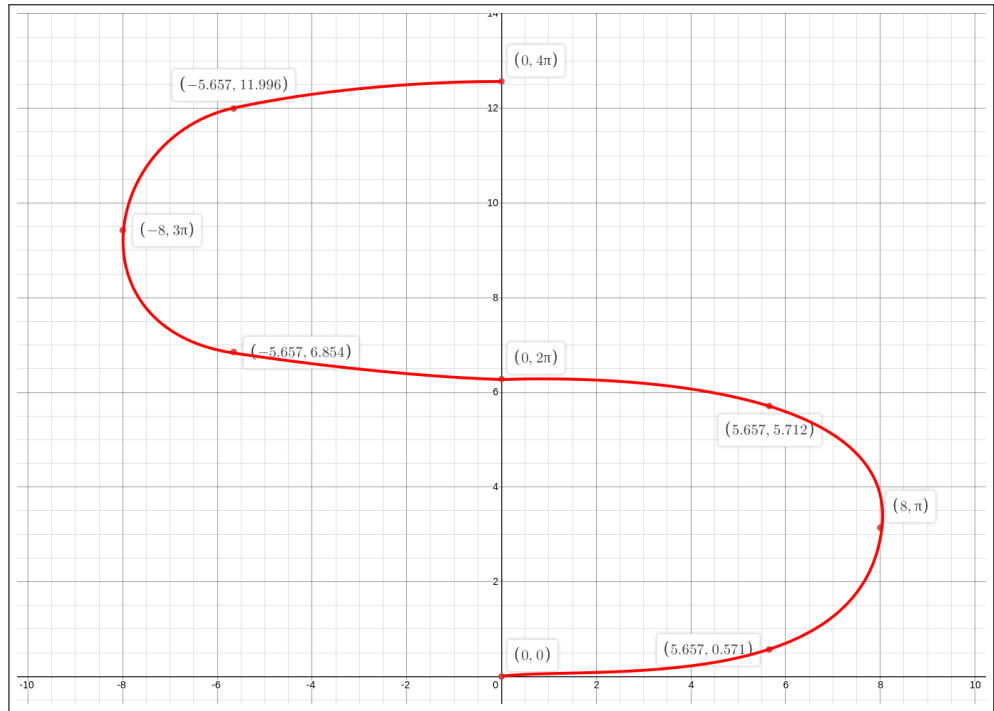# ENGR222 Assignment 1

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1. Consider the parametric equation:

$$(x, y) = (8sin(t), 2t - sin(2t))$$

over the interval $0 \leq t \leq 2\pi$

(a) Determine the location at $t = 0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}, 2\pi$ and use this to draw a rough sketch of the curve.

(b) Find the unit tangent vector to the curve when $t = \frac{\pi}{6}$

$$\left(f'(t), g'(t)\right) = (8cos(t), 2 - 2cos(2t))$$
$$t = \frac{\pi}{6} : \left(f'(t), g'(t)\right) = (6.928203, 1)$$

Calculate the unit tangent vector:

$$\frac{(f'(t), g'(t))}{||(f'(t), g'(t))||} = \frac{(6.928203, 1)}{\sqrt{6.928203^2 + 1}} = \left(\frac{6.928203}{7}, \frac{1}{7}\right)$$

(c) Determine an equation describing the tangent line at $t = \frac{\pi}{6}$

$$= (f(t), g(t)) + t\frac{(f'(t), g'(t))}{||(f'(t), g'(t))||}$$
$$= (4, 0.181) + t \cdot \left(\frac{6.928203}{7}, \frac{1}{7}\right)$$
$$= \left(\frac{6.928203 \cdot t}{7} + 4, \frac{t}{7} + 0.181\right)$$

(d) Determine an equation describing the normal line at $t = \frac{\pi}{6}$

$$=$$

2.