ENGR 2340 Dynamics
Linearization and Stability

1) How small is 'small'? Compare

$$\theta, \sin(\theta), \theta - \theta^3/6 \text{ for } [0, \pi/2]$$

2) Plot the response, $\theta(t)$ and $d\theta/dt(t)$ for

- $\ddot{\theta} + \theta = 0$
- $\ddot{\theta} + \sin\theta = 0$
- $\ddot{\theta} + \theta - \frac{\theta^3}{6} = 0$

with various initial conditions.

3) Compare the responses $\theta_1(t)$ and $\theta_2(t)$ from

$$\ddot{\theta_1} + \theta_1 = 0 \quad \text{vs.} \ \ddot{\theta_2} - \theta_2 = 0$$

for various initial conditions. Which is stable/unstable?