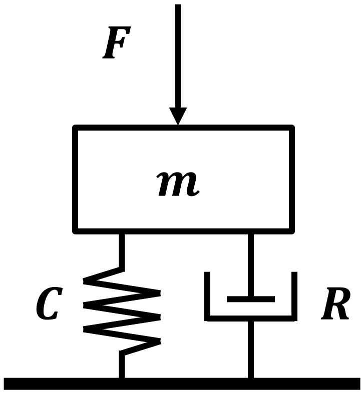
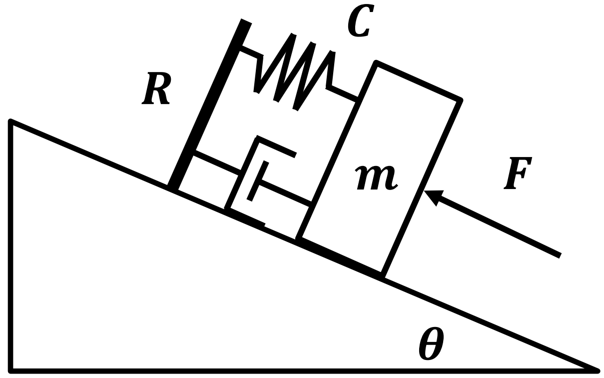
Homework Assignment:

1. We're going to re-examine the simple mass-spring-damper system from HW2, except this time, we are going to apply a harmonic excitation.



   a. Using the values m = 0.5 kg, C = 1.2665e-6 m/N, and R = 10 Nm/s, solve for the mechanical admittance (v/F) of the system above and plot the magnitude and phase as a function of ω.
   b. Set $F = 2\sin(\omega_f t)$ where ω_f is equal to the values on page 3-2 of the notes. Plot $v(t)$ and $x(t)$ given $x_0 = 0\ m$ and $v_0 = 0\ m/s$.
   c. Next, instead of treating R as a single constant, set up R as a vector with different values (some smaller, some larger). Provide plots for $Y(\omega)$, $v(t)$, and $x(t)$ with the different values of R. What is the effect of varying R?
   d. Repeat part (d), but vary C instead of R. What is the effect of varying C?

2. For the system below in which the surface is friction free, how does the angle θ affect the magnitude of oscillation? Plot the oscillation to a harmonic excitation to support your answer.



Homework Assignment:

3. Compute and plot the response of a shaft and disk system to an applied moment of $M = 5\sin(\omega_f t)$ where $\omega_f = 215\, rads/s$. Assume that the 0.2-m radius disk is initially at rest. The 1-m long steel shaft has a diameter of 5 cm, a shear modulus, G, of 8.3e10 N/m^2 and a damping ratio of 0.01.