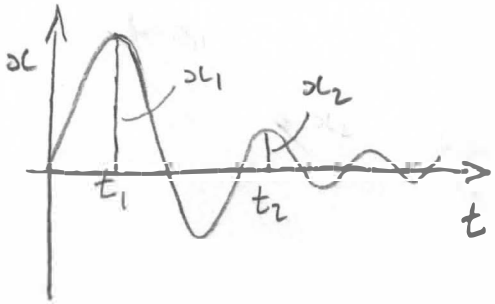
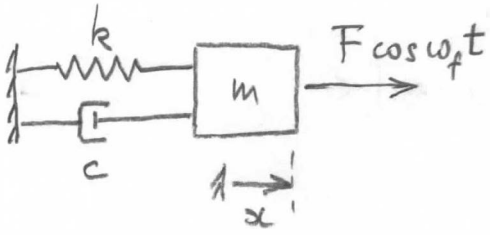
MECH 463 -- Tutorial 2

These questions require review of previous 1-DOF studies and recent material presented in class.

1. Measurement of the logarithmic decrement provides a common experimental way to determine the damping factor of a lightly damped 1-DOF vibrating system. The logarithmic decrement δ is the logarithmic ratio of the amplitudes of successive same-sign vibration peaks, $\delta = \ln(x_n/x_{n+1})$. Given that the response of a damped 1-DOF vibrating system is $x = e^{-\zeta\omega t}(A \cos \omega_d t - B \sin \omega_d t)$, determine the relationship between damping factor and logarithmic decrement.



2. The equation of motion of a 1-DOF damped vibrating system with harmonic forced excitation is $m\ddot{x} + c\dot{x} + kx = F\cos(\omega_f t)$. Using the fourth of the four solution forms discussed in class (the one involving the constant D), determine the steady state response of the system.



3. The diagram shows an accelerometer. Use the result from Q2 to determine an equation for the frequency response curve of the accelerometer (= spring stretch amplitude per unit acceleration amplitude vs. normalized frequency).