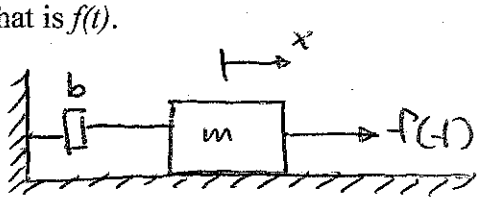
EE-154/CMPE-241
Winter 2007

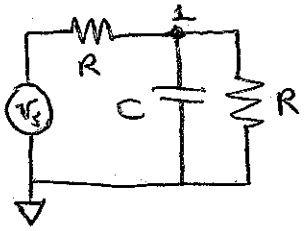
Intake Quiz

These problems should be familiar and a quick review for you. If you cannot solve these problems in under 5 minutes each, take the time to figure out how to solve these and review the material required to do so.

1. Write the free body diagram (FBD) and the equations of motion for the following system, assume frictionless surface, dashpot "b," mass "m," and a forcing function that is *f(t)*.




2. Write down the differential equation for the voltage at node 1, given a voltage source, $v_s(t)$. Resistors are valued at $R$, and capacitor is valued at $C$.




3. Given a constant coefficient, linear ordinary differential equation:
   a. Find the homogenous or natural solution, given $y(0) = y_o$.
   b. Find the steady state solution for zero initial conditions and $u(t)$ is a unit step.
   c. Find the full solution, for the above initial conditions and inputs.

$$2\dot{y} + 3y = u \qquad u = \begin{cases} 1 & t > 0 \\ 0 & t \le 0 \end{cases}$$

$$y(0) = y_0 .$$

4. Given an ideal op-amp, find $V_{out}/V_{in}$ for the following configuration: