Problem 4 HW #9-4

b) $4\frac{dv(t)}{dt} + 12v(t) = 16\cos(3t)$; $v(0^-) = 2V$

$$4s\,V(s) - 4v(0^-) + 12V(s) = \frac{16s}{s^2+9} \Rightarrow V(s) = \frac{\frac{16}{s^2+9} + 8}{4s+12}$$

$$V(s) = \frac{16 + 8s^2 + 72}{4(s+3)(s^2+9)}$$

c) $\frac{d^2}{dt^2}v(t) + 4\frac{dv(t)}{dt} + 3v(t) = 5e^{-2t}$; $v(0^-) = -2V$; $\frac{dv}{dt}(0) = 2V/s$

$$s^2V(s) - \frac{2}{s} + 4sV(s) + 8 + 3V(s) = \frac{5}{s+2}$$

$$(s^2+4s+3)\cdot V(s) = \frac{5}{s+2} - 8 + \frac{2}{s}$$

$$V(s) = \frac{5s + 8s^2 - 16s + 2s + 4}{s(s+2)}$$

$$V(s) = \frac{8s^2 - 9s + 4}{s(s+2)}$$

Problem 5:

a) at $t=0$; the switch is closed; we know that current through the inductor can't change instantly. Thus, initially inductor behaves as open circuit

$$i_L(0) = 0$$