

Quiz #2:

Solve for $x(t)$ assuming all IC's are zero.

$$\frac{d^2 x(t)}{dt^2} + 30 \frac{dx(t)}{dt} + 200 x(t) = 10 u(t)$$

Solution:

Take the Laplace Transform, setting $x(0)=0$, $dx(0)/dt=0$ as specified in the instructions.

$$[s^2 X(s) - s x(0) - dx(0)/dt] + 30 [s X(s) - x(0)] + 200 X(s) = 10/s$$

Since the IC's are zero, we rewrite

$$X(s) [s^2 + 30 s + 200] = 10/s$$

$$\text{or } X(s) = \frac{10}{s(s+10)(s+20)} = \frac{(1/20)}{s} + \frac{-(1/10)}{s+10} + \frac{(1/20)}{s+20}$$

and therefore

$$x(t) = [(1/20) + (-1/10) e^{-10t} + (1/20) e^{-20t}] u(t)$$

