Math 256 FWH 9 - Laplace Transforms

Name:_____

1. Use Laplace Transforms to find the solution to the initial value problem $y' + 5y = e^{-2t}$, $y(0) = 1$.

2. Use Laplace Transforms to find the solution to the initial value problem $y' - 3y = u_1(t)((t-1) + e^{t-1})$, $y(0) = 0$.

3. Use Laplace Transforms to determine the function modeling the current in an RLC circuit with $L = 10$ Henries, $R = 20$ ohms, $C = 0.02$ Farads, the initial charge is $Q(0) = 0$, the initial current is $I(0) = 0$, there is an electromotive force forcing the RLC circuit via the voltage function $E(t) = 10\sin(t)$, and then, at $t = 2\pi$ seconds, the battery is turned off, letting the current alternate naturally through the circuit. Use the fact the differential equation $L\dfrac{d^2Q}{dt^2} + R\dfrac{dQ}{dt} + \dfrac{1}{C}Q = (1 - u_{2\pi}(t))10\sin(t - 2\pi)$ to find the solution for $Q(t)$ and then take its derivative to find $I(t)$. Be careful of discontinuities when taking the derivative. Graph both Q and I using your favorite software and attach them.