Homework 11 - Math 243 **Name:** _____

Use the Laplace transform to convert these IVPs into algebraic equations, then solve for $Y(s)$.

1. $y'' - 5y' + 4y = 10e^{-t}$, $y(0) = 4$, $y'(0) = 5$

2. $y'' + 4y' + 3y = \cos t$, $y(0) = 1$, $y'(0) = -1$

Use partial fraction decomposition (without a computer) to break up the following rational functions. Then find the inverse Laplace transform to get $y(t)$.

3. $Y(s) = \dfrac{s + 10}{(s - 2)(s + 1)}$

4. $Y(s) = \dfrac{4s^2 + 9s + 5}{(s + 1)(s - 1)(s - 4)}$

Find the inverse Laplace transforms of the following. Hint: Use a computer to handle the partial fraction decompositions.

5. $Y(s) = \dfrac{s^3 + 3s^2 + 2s + 3}{(s^2 + 1)(s + 1)(s + 3)}$

6. $Y(s) = \dfrac{s^2 + 1}{(s - 1)(s - 2)^2}$

Use the Laplace transform to solve the following initial value problems.

7. $y'' + 2y' + y = H(t-1) - H(t-2)$ where $y(0) = y'(0) = 0$ and $H(t)$ is the Heavyside step function.

8. $y'' + 2y' + y = \delta(t)$ where $y(0) = y'(0) = 0$ and $\delta(t)$ is the Dirac delta function.