Homework #1

1. Derive the Laplace transform of the third derivative of f(t).
2. Write the partial fraction expansion of the following functions?

   a. $F_1(s) = \dfrac{s+5}{(s+1)(s+3)}$

   b. $F_2(s) = \dfrac{3(s+4)}{s(s^2+3s+2)}$

   c. $F_3(s) = \dfrac{6s+3}{s^2}$

   d. $F_4(s) = \dfrac{s^2+2s+4}{s^2}$

   e. $F_5(s) = \dfrac{2s+10}{(s+1)^2(s+4)}$

3. What are the inverse Laplace transforms of the following functions (same functions as in #2)?

   a. $F_1(s) = \dfrac{s+5}{(s+1)(s+3)}$

   b. $F_2(s) = \dfrac{3(s+4)}{s(s^2+3s+2)}$

   c. $F_3(s) = \dfrac{6s+3}{s^2}$

   d. $F_4(s) = \dfrac{s^2+2s+4}{s^2}$

   e. $F_5(s) = \dfrac{2s+10}{(s+1)^2(s+4)}$

4. Find x(t) for the following initial value problems. Use Laplace transforms concepts to solve.

   a. $\ddot{x} - 4x = 0 \quad x(0) = 1 \qquad \dot{x}(0) = 2$

   b. $\ddot{x} + x = sin3t \qquad\qquad x(0) = 0 \qquad \dot{x}(0) = 0$

   c. $\ddot{x} - 3\dot{x} + 2x = 4t - 6 \qquad x(0) = 1 \quad \dot{x}(0) = 3$

   d. $\dot{x} + 5x = 7te^{-3t} \qquad\qquad x(0) = 0$