

**Differential Equations (92.236)**  
**Homework Assignment #16 Spring 2007**  
*More Laplace Transforms*

**Problem 1:**

Find the inverse L.T. of the following functions:

a.  $F(s) = \frac{1}{s^2 + 4s + 4}$

b.  $F(s) = \frac{1}{s^4 - 16}$

**Problem 2:**

Use Laplace transforms to solve the following IVPs:

a.  $x'' + 3x' + 2x = t$  with  $x(0) = 0$  and  $x'(0) = 2$

b.  $x'' + 4x' + 8x = e^{-t}$  with  $x(0) = 0$ ,  $x'(0) = 0$

**Problem 3:**

Two important Laplace transform properties are:

$$t^n f(t) \Leftrightarrow (-1)^n F^{(n)}(s) \quad \text{and} \quad e^{at} f(t) \Leftrightarrow F(s - a)$$

Use these two properties, as needed, to derive formulas for the Laplace transform of the following functions:

a.  $f(t) = t^2 \cos(2t)$

b.  $f(t) = t^2 e^{-t} \cos(2t)$