MATH 256 Sections 102 & 103)  
**Homework Assignment 7**  
Due 2:00 p.m. Friday 2015 November 6  
*Homework submitted after 2:50 will not be marked.*

1. Use the Laplace transform (use Table 6.2.1 on p. 321) to solve the initial value problems:
   (a) \( y'' - 2y' + 2y = \cos t, \quad y(0) = 1, \quad y'(0) = 0. \)
   (b) \( y'' + 2y' + y = 4e^{-t}, \quad y(0) = 2, \quad y'(0) = -1. \)

2. Find the inverse Laplace transform of \( F(s) = \frac{2(s-1)e^{-2s}}{s^2-2s+2}. \)

3. Use the Laplace transform to solve the initial value problem
   \[ y'' + 2y' + 2y = g(t), \quad y(0) = 0, \quad y'(0) = 1, \]
   where \( g(t) = 1 \) for \( \pi \leq t < 2\pi \) and \( g(t) = 0 \) otherwise. Express the solution \( y(t) \) as a piecewise defined function, simplified.

4. Use the Laplace transform to solve the initial value problem
   \[ y'' + y = g(t), \quad y(0) = 0, \quad y'(0) = 1, \]
   where \( g(t) = t/2 \) for \( 0 \leq t < 6 \) and \( g(t) = 3 \) for \( t \geq 6 \). Sketch the graphs of the forcing function ("input") \( g(t) \) versus \( t \), and the solution ("output") \( y(t) \) versus \( t \).

5. Use the Laplace transform to solve the initial value problem
   \[ y'' + y = u_{\pi/2}(t) + 3\delta \left( t - \frac{3\pi}{2} \right) - u_{2\pi}(t), \quad y(0) = 0, \quad y'(0) = 0. \]