Math 222 Quiz 8
March 30, 2011

Your Name: 
Your Section: 

Instructions: You have 20 minutes to solve the following problems and the total score is 10 points. Bonus problems are tricky.

1. Use the method of undetermined coefficients
   a). \( y'' + y = 2x + 3e^x \) (2 pts) b). \( y'' + y = \sin x, \ y(0) = 0, y(\frac{\pi}{2}) = 0 \) (3 pts)

2. 3 pts if variation of parameters and 2 pts otherwise.
   \( y'' - y = xe^x \) Just in case you need: \( y_p \) has the form \( Axe^x + Bx^2e^x \)

3. a). \( ay'' + by' + cy = G(x) \). If \( y_p \) is a solution, \( y \) is any other solution, then \( y - y_p = y_c \) is the solution to the complementary equation. (1 pt)
   b). In a, if \( G(x) = G_1(x) + G_2(x) \), \( y_{p1} \) solves \( ay'' + by' + cy = G_1(x) \) and \( y_{p2} \) solves \( ay'' + by' + cy = G_2(x) \), then \( y_p \) can be chosen to be \( y_{p1} + y_{p2} \) (1 pt)
Bonus 1: $y''' - 7y' + 6y = x^2$ (2 pts). Hint: For $y''' - 7y' + 6y = 0$, $e^x$ is a solution, so the aux. equation (which exists since coefficients are constants) has a factor $r - 1$.

Bonus 2: Simple Harmonic Motion: A mass $m$ is attached on a spring that has a spring constant $k$. Pull the mass with a displacement $y(0) = C$ from equilibrium position $O$ to $A'$ and then release. Supposing no friction, find the equation the displacement $y(t)$ satisfies (1 pt) and the time needed to reach the midpoint of $O$ and $A'$ for the first time. (2 pts)