MATH 1B DISCUSSION WORKSHEET - 11/27/18

LINEAR HOMOGENEOUS SECOND ORDER DIFFERENTIAL EQUATIONS, AND METHOD OF UNDETERMINED COEFFICIENTS

1. Homogeneous Equations

Solving these problems boils down to three cases. Fill in the following table to help you remember how to solve each of the three.

Solutions to the differential equation $ay'' + by' + c = 0$

Types of Roots	Value of $b^2 - 4ac$	General Solution
r_1 and r_2 are real and distinct	positive	
r_1 is a double root		
r_1 and r_2 are complex conjugates $\alpha \pm \beta i$		$y = e^{\alpha x}(C_1 \cos(\beta x) + C_2 \sin(\beta x))$

You would think that by now I should know how to center text in a table, but I couldn't figure it out in a minute's worth of google searches so I gave up on it. Pretend they're centered.

Using the table, classify the following differential equations into one of the three cases, and use that classification to determine the general solution. Using this and the values given, solve for the values of the constants.

(1) $y'' + 6y' + 5y = 0, y(0) = 1, y'(0) = 0$

(2) $y'' + 12y' + 37y = 0, y(0) = 4, y'(0) = 0$

(3) $y'' - 8y' + 16y = 0, y(0) = -3, y'(0) = 4$

2. Nonhomogeneous equations part 1: Method of Undetermined Coefficients

For each of the following differential equations, what guess should I be using for my particular solution?

(1) $y'' + 6y' + 4y = e^t$

(2) $y'' + 2y' + y = t^3$

(3) $y'' + 3y' + 2y = 2\sin(t) + \cos(t)$

(4) $y'' - 6y' + 9y = e^{3t}$

(5) $y'' + 16y = \cos(4t)$

(6) $y'' + 2y' + y = e^x \cos(x)$