Math 274 In-Class **Worksheet 5p**
Sections: 4.4,4.5

Method of Undetermined Coefficients

To find a particular solution to

$$ay'' + by' + cy = P_m(t)e^{rt}$$

where $P_m(t)$ is a polynomial of degree m, use the form

$$y_p(t) = t^s \left(A_m t^m + \cdots + A_1 t + A_0\right) e^{rt};$$

if r is not a root of the associated auxiliary equation, take $s = 0$; if r is a simple root, take $s = 1$; and if r is a double root, take $s = 2$.
To find a particular solution to

$$ay'' + by' + cy = P_m(t)e^{\alpha t}\cos\beta t + Q_n(t)e^{\alpha t}\sin\beta t$$

where $P_m(t)$ and $Q_n(t)$ are polynomials of degree m and n, respectively, use the form

$$y_p(t) = t^s \left(A_k t^k + \cdots + A_1 t + A_0\right) e^{\alpha t}\cos\beta t + t^s \left(B_k t^k + \cdots + B_1 t + B_0\right) e^{\alpha t}\sin\beta t;$$

where k is the larger of m and n. If $\alpha + i\beta$ is not a root of the associated auxiliary equation, take $s = 0$; if so take $s = 1$.

1. Find the appropriate form using the Method of Undetermined Coefficients for a particular solution to the following. **Do not** solve for the unknown constants.

   (a) $y'' - 4y' + 4y = t\sin 3t$

   (b) $y'' - 4y' + 4y = te^t + 3e^{4t}$

   (c) $y'' - y' - 6y = e^{3t} + 7t^2$

   (d) $y'' + 9 = \sin 3t$

   (e) $y'' + 9 = e^{2t}\cos 3t$

STOP! Don't move on until you know these are correct.

2. Find a general solution for the following.

(a) $y'' + y = 4$

(b) $y'' + y = 4t$

(c) $y'' = 4$

(d) $y'' + 6y' + 8y = 16 + 6e^{-2t}$

(e) $y'' + 6y' + 8y = \cos 2t$