BİLKENT UNIVERSITY
Department of Mathematics

MATH 240, DIFFERENTIAL EQUATIONS, Homework set # 5

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METHOD OF UNDETERMINED COEFFICIENTS

1) Find the general solution of the following D.E's

a) $y'' - 2y' - 3y = 3e^{2x}$.

b) $y'' + 2y' = 3 + 4\sin 2x$.

c) $y'' + 2y' + y = 2e^{-x}$.

d) $y'' + y = 3\sin 2x + x\cos 2x$.

e) $y'' + y' + 4y = 2\sinh x$, Hint: $\sinh x = (e^x - e^{-x})/2$.

2) Solve the following I.V.P.

a) $y'' + y' - 2y = 2x, \qquad y(0) = 0, \quad y'(0) = 1.$

b) $y'' - 2y' - 3y = 3xe^{2x}, \qquad y(0) = 1, \quad y'(0) = 0.$

3) Determine a suitable form for the particular solution $y_p(x)$ if the method of undetermined coefficients (M.U.C) is to be used. **Do not evaluate the coefficients**.

a) $y'' + 3y' = 2x^4 + x^2e^{-3x} + \sin 3x$.

b) $y'' + 2y' + 2y = 3e^{-x} + 2e^{-x}\cos x + 4e^{-x}x^2\sin x$.

c) $y'' + 2y' + 5y = 3xe^{-x}\cos 2x - 2xe^{-2x}\cos x$.

METHOD OF UNDETERMINED COEFFICIENTS, HIGHER ORDER D.E.

4) Determine the general solution of the given D.E.

a) $y''' - y'' - y' + y = 2e^{-x} + 3$.

b) $y''' + 4y' = x, \qquad y(0) = y'(0) = 0, \quad y''(0) = 1.$

5) Determine a suitable form for the particular solution $y_p(x)$ if the method of undetermined coefficients (M.U.C) is to be used. **Do not evaluate the coefficients**.

a) $y''' - 2y'' + y' = x^3 + 2e^x$

b) $y^{(4)} - y''' - y'' + y' = x^2 + 4 + x\sin x$.

c) $y^{(4)} + 4y'' = \sin 2x + xe^x + 4$.

6) For each of the equations in exercise #5, obtain the differential operator $g(D)$ such that $g(D)R(x) = 0$ and then find the form of the particular solution $y_p(x)$ from

$$g(D)f(D)y = g(D)R(x) = 0.$$