

## Math 246 Homework Assignment Four

Do the following problems showing all your work. Be sure to submit your solutions in PDF format to the Assignment area. (Point values are given in the square brackets.)

Find the general solution(s)  $y(x)$  to these differential equations:

1. [3]  $y'' + 6y' + 10y = 10x^4 + 24x^3 + 2x^2 - 12x + 18$

2. [3]  $y'' - 2y' + y = 2e^x$  which has particular solution  $y(x) = e^x x^2$

3. [3]  $y'' + 4y = \cos^2(2x)$

4. [3]  $y'' - 4y' + 4y = x^{-2}e^{2x}$

Find the particular solution to the differential equation:

5. [3]  $y^{(4)} - 3y^{(3)} + 3y'' - y' = 6x - 20$

6. [3]  $y'' + 3y' + 4y = 3x + 2$

7. [3]  $y'' - 9y = 3e^{2x}$

Solve these problems:

8. [4] A mass-spring system is driven by the external force  $g(t) = 2 \sin(3t) + 10 \cos(3t)$ . The mass equals 1, the spring constant equals 5, and the damping coefficient equals 2. If the mass is initially located at  $y(0) = -1$ , with initial velocity  $y'(0) = 5$ , find its equation of motion. [Note that the solution has two parts, one (called the *transient*) which goes to zero as time increases, and another, which is periodic (called the *steady state* solution.) Identify these two parts in a graph of the solution function.]