

Math 3280 Assignment 8, due Friday, April 4th.

The problems on this assignment are all directly related to the material in chapter 5.5 of the text.

- (1) Find a particular solution to the ODE  $y'' - y' + 2y = 4x + 12$ .
- (2) Find a particular solution to the ODE  $y'' - y' + y = \sin^2(x)$ . (Hint: it may be helpful to use a trig identity.)
- (3) Find the general solution to  $y^{(3)} - y' = e^x$ .

For the following two problems, determine the form of the particular solution - note that **you do not have to determine the values of the coefficients**. You should not include terms from the homogeneous (complementary) solution.

- (4) Determine the form of the particular solution to  $y''' = 9x^2 + 1$ .
- (5) Determine the form of the particular solution to  $y^{(4)} - 16y'' = x^2 \sin(4x) + \sin(4x)$ .
- (6) Solve the initial value problem  $y'' + 2y' + 2y = \cos(3x)$ ,  $y(0) = 0$ ,  $y'(0) = 2$ .
- (7) Solve the initial value problem  $y^{(4)} - y = 1$ ,  $y(0) = y'(0) = y''(0) = y^{(3)}(0) = 0$ .
- (8) Use the variation of parameters method to find the general solution of

$$y'' - 2y' + y = e^x/x$$

- (9) Use the variation of parameters method to find the general solution of

$$y'' + 9y = 12 \sec(3x).$$

- (10) How many times can an overdamped mass-spring system ( $mx'' + cx' + kx = 0$  with  $c^2 > 4mk$ ;  $c$ ,  $m$ , and  $k$  are non-negative) with arbitrary initial conditions  $x(0) = x_0$ ,  $x'(0) = v_0$  pass through  $x = 0$ ? What if it is critically damped ( $c^2 = 4mk$ )?