

Name: key Section: _____
MAP 2302 - Ordinary Differential Equations I
February 26, 2016
Quiz 4

1. Find the general solution to the following homogeneous differential equation:

$$2y'' + 3y' + y = 0$$

$$2r^2 + 3r + 1 = 0 \Rightarrow (2r+1)(r+1) = 0 \Rightarrow r = -\frac{1}{2}, -1$$

$$y_h = c_1 e^{-1/2 t} + c_2 e^{-t}$$

2. Use the homogeneous solution from question one and the method of undetermined coefficients to find the particular solution to

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

$$\begin{array}{l|l} 1 & y_p = At^2 + Bt + C \\ 3 & y_p' = 2At + B \\ 2 & y_p'' = 2A \end{array}$$

Note: We needed to know the homogeneous solution to check for resonance.

$$(A)t^2 + (B+6A)t + (C+3B+4A) = t^2$$
$$\Rightarrow A=1, B+6A=0, C+3B+4A=0$$
$$\Rightarrow B=-6 \Rightarrow C-18+4=0$$
$$\Rightarrow C=14$$

$$\therefore y_p = t^2 - 6t + 14$$

3. Write the general solution to the inhomogeneous equation from question two.

$$y = y_p + y_h = t^2 - 6t + 14 + c_1 e^{-t/2} + c_2 e^{-t}$$