MAP 2302 - Quiz #2 **Name:**

For full credit, you must show all work and circle your final answer.

1a. *(2 points)* Write the form of the particular solutions.

(a) $y'' - y = e^{2t}\sin(t)$.

Aux eqn: $r^2 - 1 = 0 \Rightarrow r = \pm 1$ so $s = 0$

$y_p = Ae^{2t}\cos t + Be^{2t}\sin t$

(b) $y'' - 2y' + y = (8t+1)e^t$.

Aux eqn: $r^2 - 2r + 1 = 0 \Rightarrow r = 1$ double root

so $s = 2$

$y_p = t^2(At+B)e^t$

1b. *(1 point)* Calculate the Wronskian of the two functions below and determine if they are linearly independent over the interval $(0, \infty)$.

$$y_1(x) = e^{2x}, \quad y_2(x) = e^{-3x}$$

$$W[y_1, y_2] = \begin{vmatrix} e^{2x} & e^{-3x} \\ 2e^{2x} & -3e^{-3x} \end{vmatrix} = -3e^{-x} - 2e^{-x} = -5e^{-x}$$

$W[y_1, y_2] \neq 0$ on $(0, \infty)$

y_1 and y_2 are linearly indep.

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2 *(2 points)* Use the method of variation of parameters to find a particular solution for

$$ty'' - (t+1)y' + y = t^2,$$

given the homogeneous solutions

$$y_1(t) = e^t \quad y_2(t) = t + 1.$$

$$W[y_1, y_2] = \begin{vmatrix} e^t & t+1 \\ e^t & 1 \end{vmatrix} = e^t - (e^t(t+1)) = -te^t$$

$$V_1 = \int \frac{-y_2 g}{W[y_1,y_2]}\,dt \qquad V_2 = \int \frac{y_1 g}{W[y_1,y_2]}\,dt \qquad \text{Where } g(t) = t^2/t = t$$

IBP

$$\boxed{\begin{matrix} u = t+1 & dv = e^{-t}dt \\ du = dt & V = -e^{-t} \end{matrix}}$$

$$= \int \frac{-(t+1)t}{-te^t}\,dt \qquad = \int \frac{e^t t}{-te^t}\,dt$$

$$= \int (t+1)e^{-t}\,dt \qquad = \int -1\,dt$$

$$= -(t+1)e^{-t} - \int -e^{-t}\,dt \qquad = -t$$

$$= -(t+1)e^{-t} - e^{-t}$$

$$= -e^{-t}(t+2)$$

$$y_p = V_1 y_1 + V_2 y_2$$

$$y_p = -e^{-t}(t+2)e^t + (-t)(t+1)$$

$$y_p = -t - 2 - t^2 - t$$

$$\boxed{y_p = -(t^2 + 2t + 2)}$$

University of Florida Honor Code:

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

Signature