Math 271 - Quiz #8 **Score:** _______ out of 10.

Name: key

Show all work clearly and in order. Please box your answers. 10 minutes.

1. Solve the following differential equation:

$$y'' - 4y' + 3y = 2e^x$$

Step (i): Solve for y_c:

$$y'' - 4y' + 3y = 0$$
$$m^2 - 4m + 3 = 0$$
$$(m-3)(m-1) = 0$$
$$m = 3 \mid m = 1$$
$$y_c = C_1 e^{3x} + C_2 e^x$$

Step (ii): Solve for y_p:

Form for y_p looking at $g(x) = 2e^x$:
$$y_p = Ae^x$$
Adjust looking at y_c since e^x is part of y_c:
$$y_p = Axe^x$$
Now
$$y_p' = Axe^x + Ae^x$$
$$y_p'' = Axe^x + Ae^x + Ae^x = Axe^x + 2Ae^x$$

$$y'' - 4y' + 3y = 2e^x \Rightarrow \cancel{Axe^x} + 2Ae^x \cancel{- 4Axe^x} - 4Ae^x + \cancel{3Axe^x} = 2e^x$$
$$-2Ae^x = 2e^x$$
$$-2A = 2$$
$$A = -1$$
$$y_p = -xe^x$$

$y = y_c + y_p \longrightarrow$

General Solution: $\boxed{y = C_1 e^{3x} + C_2 e^x - xe^x}$

2. Using the method of undetermined coefficients write the FORM for the particular solution (y_p) using the given value for $g(x)$ and the general solution of the associated homogeneous equation (y_c). Do NOT solve for the unknown constants, just write the form.

(a) $g(x) = 9e^{2x}$ and $y_c = C_1e^{-x} + C_2xe^{-x}$. so

Form of y_p: $\boxed{Ae^{2x}}$

(b) $g(x) = 9e^{2x}$ and $y_c = C_1e^{2x} + C_2xe^{2x}$. so

Form of y_p: $\boxed{Ax^2e^{2x}}$

(c) $g(x) = 3\cos(2x)$ and $y_c = C_1\sin(2x) + C_2\cos(2x)$. so

Form of y_p: $\boxed{Ax\sin(2x) + Bx\cos(2x)}$