Quiz 3/**test prep 2** Name: (*10 pts*) ______________________________

(please print neatly!)

Directions: Answer each of the following **two (2)** questions, making sure to read the instructions for each question as you proceed.

You may use the backs of the pages for scratch work **or** get scrap paper from me!

The last page is a bonus problem! Make sure you don't overlook it!

1. (*20 pts*) Solve the IVP

$$y'' + 2y' + y = 3e^{-x}, \quad y(0) = 1, \quad y'(0) = 1.$$

Hint: $\left(x^2 e^{kx}\right)' = kx^2 e^{kx} + 2xe^{kx}$ and $\left(x^2 e^{kx}\right)'' = k^2 x^2 e^{kx} + 4kxe^{kx} + 2e^{kx}$ for all constants k.

SOLUTION:

2. (a) (*6 pts*) **True or False:** $y_1(t) = e^{-2t}$ and $y_2 = e^{3t}$ are both solutions to the second-order homogeneous ODE

$$y'' - y' - 6y = 0.$$

Justify your claim!

SOLUTION:

(b) (*4 pts*) **True or False:** $y_1(t) = e^{-2t}$ and $y_2 = e^{3t}$ form a fundamental system of solutions for the second-order homogeneous ODE

$$y'' - y' - 6y = 0.$$

Justify your claim!

SOLUTION:

(c) (*10 pts*) *Without using undetermined coefficients*, use parts (a) and (b) to find a particular solution of the non-homogeneous ODE

$$y'' - y' - 6y = e^{-3t}.$$

Simplify fully.

SOLUTION:

Bonus: (*5 pts*) Use the method of undetermined coefficients to check the answer you got for problem 2(c).

In other words: Use the method of undetermined coefficients to find a particular solution of the non-homogeneous ODE

$$y'' - y' - 6y = e^{-3t}.$$

Hint: When using variation of parameters, some of the terms produced in the formula for $Y(t)$ may have the form (const)y_1 or (const)y_2; to get that answer to match the one obtained using undetermined coefficients, you want to <u>ignore</u> any such terms! (make sure you know why!)

SOLUTION: