Math 240 - Quiz 1

January 19, 2023

Name key

Score _____

Supply explanations if necessary.

1. (8 points) State whether each equation is ordinary or partial, linear or nonlinear, give its order, and say which variable is dependent.

(a) $\frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial x^2} = x^2 + y^2$

PARTIAL, LINEAR, 2ND ORDER, u IS DEPENDENT.

(b) $(x^2 + y^2)\,dx + 2xy\,dy = 0$

ORDINARY, 1ST ORDER, EITHER VARIABLE COULD BE DEPENDENT - I'LL CHOOSE y. THE EQUATION IS NONLINEAR IN y (BECAUSE OF y^2 & ydy)

(c) $t^2x'' - 3tx' + 2x = t^2 \sin 5t$

ORDINARY, 2ND ORDER, LINEAR, X IS DEPENDENT.

(d) $y\frac{dy}{dx} - e^x y = -3x + 5$

ORDINARY, 1ST ORDER, NONLINEAR $\left(y\frac{dy}{dx}\right)$, y IS DEPENDENT.

2. (2 points) Show that $y_1 = e^{2x}$ and $y_2 = e^{-3x}$ are solutions of $y'' + y' - 6y = 0$.

$y_1 = e^{2x}$

$y_1' = 2e^{2x}$

$y_1'' = 4e^{2x}$

$y_1'' + y_1' - 6y_1 = 4e^{2x} + 2e^{2x} - 6e^{2x}$

$= 0$ ✓

$y_2 = e^{-3x}$

$y_2' = -3e^{-3x}$

$y_2'' = 9e^{-3x}$

$y_2'' + y_2' - 6y_2 = 9e^{-3x} - 3e^{-3x} - 6e^{-3x}$

$= 0$ ✓