

Math 216 - Quiz 1

January 18, 2012

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (6 points) Classify each differential equation as ordinary or partial, linear or nonlinear; give its order; and indicate the independent variable(s) and dependent variable.

(a) $3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 8y = 0$ ORDINARY, LINEAR, 2ND ORDER

y IS DEPENDENT, x IS INDEPENDENT

(b) $z^2 \frac{\partial z}{\partial y} + 7x \frac{\partial z}{\partial x} = xyz$ PARTIAL, NONLINEAR, 1ST ORDER

z IS DEPENDENT; x, y ARE INDEPENDENT

(c) $(3t + 5) \frac{dw}{dt} = \sin(w)$ ORDINARY, NONLINEAR, 1ST ORDER

w IS DEPENDENT, t IS INDEPENDENT

2. (4 points) Consider the following differential equation:

$$\frac{dy}{dx} = -\frac{2xy^2 + 1}{2x^2y}$$

- (a) Show that $x^2y^2 + x = C$ is an implicit solution for any constant C .

$$\frac{d}{dx} (x^2y^2 + x) = \frac{d}{dx} (C)$$

$$2xy^2 + 2x^2y \frac{dy}{dx} + 1 = 0$$

$$\frac{dy}{dx} = \frac{-1 - 2xy^2}{2x^2y}$$

WHICH IS SAME AS

- (b) Find a constant C so that the solution satisfies the initial condition $y(1) = 1$.

$$y = 1 \text{ when } x = 1$$



$$(1)^2(1)^2 + 1 = C \Rightarrow C = 2$$