

Homework #3

Math 527, UNH fall 2015

Due Tuesday, Sept. 8th in recitation

The usual instructions: AWE: Always Write Equations! ADTSTTBSOTE: Always Do The Same Thing To Both Sides Of The Equation! Use loose-leaf paper. Staple the pages together in the upper left-hand corner. Write your name, "Math 527, section #" (with your correct section number), and "HW 3" in the upper-right corner of the first page. **Your work, name, and section number must be legible and organized!**

Problem 1. Classify each differential as separable, 1st order linear, exact, homogeneous, or Bernoulli. Some equations may be more than one kind. Do not solve the equation.

$$(a) \quad \frac{dy}{dx} = \frac{x - y}{x}$$

$$(b) \quad \frac{dy}{dx} = \frac{1}{y - x}$$

$$(c) \quad (x + 1) \frac{dy}{dx} = -y + 10$$

$$(d) \quad \frac{dy}{dx} = \frac{1}{x(x - y)}$$

$$(e) \quad \frac{dy}{dx} = \frac{y^2 + y}{x^2 + x}$$

$$(f) \quad \frac{dy}{dx} = 5y + y^2$$

$$(g) \quad y = (y - xy^2) \frac{dy}{dx}$$

$$(h) \quad x \frac{dy}{dx} = ye^{x/y} - x$$

$$(i) \quad xy \frac{dy}{dx} + y^2 = 2x$$

$$(j) \quad 2xy \frac{dy}{dx} + y^2 = 2x^2$$

Problems 2-5. Solve the differential equation.

$$2.) \quad y^2 + 1 = y \sec^2 x \frac{dy}{dx}$$

$$3.) \quad (6x + 1)y^2 \frac{dy}{dx} + 3x^2 + 2y^3 = 0$$

$$4.) \quad t \frac{dQ}{dt} + Q = t^4 \ln t$$

$$5.) \quad (2x + y + 1) \frac{dy}{dx} = 1$$

Problems 6-7. Solve the initial value problem and give the largest interval on which the solution is defined.

$$6.) \quad \sin x \frac{dy}{dx} + (\cos x)y = 0, \quad y(7\pi/6) = -2$$

$$7.) \quad \frac{dy}{dt} + 2(t + 1)y^2 = 0, \quad y(0) = -1/8$$

These problems are taken from Chapter 2 review problems in Zill's "First Course in Differential Equations with modeling applications," 9th ed. Brooks/Cole, 2009.