

Math 307 - Differential Equations - Spring 2017

Quiz 3

February 23, 2017

Name: Solutions

Problem 1.

(a) Solve the differential equation:

$$xy' + 2y = 8x^2, x > 0.$$

(b) Find the solution to the initial value problem:

$$xy' + 2y = 8x^2, y(1) = 3.$$

$$\textcircled{a} \quad xy' + 2y = 8x^2 \rightarrow y' + \frac{2}{x}y = 8x$$
$$u = e^{\int \frac{2}{x} ds} = e^{2 \ln|x|} = e^{\ln(x^2)} = x^2$$

$$y = \frac{1}{x^2} \int x^2 (8x) dx = \frac{1}{x^2} \int 8x^3 dx = \frac{1}{x^2} (2x^4 + C)$$

$$\Rightarrow \boxed{y = 2x^2 + Cx^{-2}}$$

$$\textcircled{b} \quad y(1) = 2(1)^2 + C(1)^{-2} = 2 + C = 3 \Rightarrow C = 1$$

$$\boxed{y = 2x^2 + x^{-2}}$$