Math 307 - Differential Equations - Spring 2017
Quiz 2
February 16, 2017

Name: __Solution__

Problem 1.

(a) *Solve the following separable differential equation:*

$$y' + y = 3.$$

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

$$y' + y = 3, y(1) = 4.$$

(a)
$$y' + y = 3 \implies y' = 3 - y \overset{*}{\implies} \int \frac{1}{3-y} dy = \int dx$$

$$\implies -\ln|3-y| = x + C \implies \underset{e}{(\ln|3-y|)} = \underset{e}{(C-x)}$$

$$\implies |3-y| = e^{C-x} = e^{C} e^{-x} \implies 3 - y = \pm e^{C} e^{-x}$$

$$\implies y = Ce^{-x} + 3, \quad C \neq 0.$$

Check $y \equiv 3$: $(3)' + 3 = 3$ ✓

If $C = 0$ $\quad y = 0e^{-x} + 3$, so solution is

$$\boxed{y = Ce^{-x} + 3}$$

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(b) $y(1) = Ce^{-1} + 3 = 4 \implies C = e$.

$$\implies y = ee^{-x} + 3 = \boxed{e^{1-x} + 3 = y}$$