

Math 10A with Professor Stankova

Quiz 6; Wednesday, 10/4/2017

Section #107; Time: 11 AM

GSI name: Roy Zhao

Name: _____

Circle True or False or leave blank. (1 point for correct answer, -1 for incorrect answer, 0 if left blank)

1. True **FALSE** Given an initial condition, there only exists at most one anti-derivative of a function.
2. True **FALSE** For any real number α , an antiderivative of x^α is $\frac{x^{\alpha+1}}{\alpha+1}$.

Show your work and justify your answers. Please circle or box your final answer.

3. (10 points) When filling up a glass of water, after t seconds, the height of the water is increasing at a rate of $2e^{-t}$ cm/s.
 - (a) (4 points) Let $h(t)$ denote the height of the water after t seconds. Write a differential equation for h (write $\frac{dh}{dt} = \text{something}$).

Solution: We are told that the height is increasing at a rate of $2e^{-t}$ so the differential equation is

$$\frac{dh}{dt} = 2e^{-t}.$$

- (b) (4 points) Initially, the glass is empty. Find the equation for $h(t)$.

Solution: The general form is $h(t) = -2e^{-t} + C$ and we are told that $h(0) = 0$ so $-2 + C = 0$ so $C = 2$. Thus, we have that $h(t) = 2 - 2e^{-t}$.

- (c) (2 points) How high is the water level after 2 seconds?

Solution: The height is $h(2) = 2 - 2e^{-2}$.