

Name: _____

Mark: $\overline{25}$

MATH 100 Assignment 7

1. (4 marks) Suppose the rate at which sugar dissolves in water is proportional to the amount of undissolved sugar present. If 10 pounds of sugar are put in water and 4 pounds dissolve after 2 hours, then how much undissolved sugar would remain 5 hours after the sugar is put in water? Round your answer to two decimal places.

- 2. (6 marks) When an antibiotic is introduced into a culture of bacteria, the number of bacteria decreases exponentially. Suppose there are 12,000 bacteria 6 hours after the introduction of an antibiotic and there are 10,000 bacteria 9 hours after the antibiotic is introduced.
 - (a) How many bacteria are there initially?

(b) How many bacteria are there 2 hours after the antibiotic is introduced?

(c) How many hours does it take until 95% of the bacteria are gone? Round your answer to one decimal place.

- 3. Write and solve the differential equation that models each statement. Write your solutions in explicit form if possible.
 - (a) (3 marks) "The rate of change of x with respect to t is proportional to 5 t."

(b) (3 marks) "The rate of change of x with respect to t is inversely proportional to the square of x."

- 4. Solve the differential equations. Write your solutions in explicit form if possible.
 - (a) (3 marks) $y' = \frac{2xy}{(\ln y)^4}$

(b) (3 marks) $\sqrt{xy'} - 3y = 3$

5. (3 marks) Find the particular solution of the differential equation

$$\frac{dz}{dw} = e^{2z-w}$$

satisfying the initial condition z(0) = 0. Write your solution in explicit form if possible.