Homework 7.5 – Differential Equations

1. (1 pt) alfredLibrary/AUCI/chapter7/lesson5/checksolution1.pg
If $y(t) = 4\cos(5t)$,

then $y'(t) =$ _____,

and $y''(t) =$ _____.

Therefore, y satisfies which of the following differential equations? Check all that apply.

- A. $y' = 5y$
- B. $y' = -5y$
- C. $y'' = 25y$
- D. $y'' = -25y$

2. (1 pt) alfredLibrary/AUCI/chapter7/lesson5/checksolution2.pg
If $y(t) = 6e^{5t}$,

then $y'(t) =$ _____,

and $y''(t) =$ _____.

Therefore, y satisfies which of the following differential equations? Check all that apply.

- A. $y' = 5y$
- B. $y' = -5y$
- C. $y'' = 25y$
- D. $y'' = -25y$

3. (1 pt) alfredLibrary/AUCI/chapter7/lesson5/simplemodel1pet.pg
The knowledge K (measured in volumes of research published) that a civilization can amass per year is proportional to the knowledge it currently possesses. Suppose that this civilization can continuously add 7

$K' =$ ___K, where $K(0) =$ ____.

The solution to this problem is $K(t) =$ _____.

4. (1 pt) alfredLibrary/AUCI/chapter7/lesson5/newtonslaw5pet.pg
A cup of coffee at 193 degrees is poured into a mug and left in a room at 75 degrees. After 7 minutes, the coffee is 142 degrees. In this example, the differential equation describing Newton's Law of Cooling is $\frac{dT}{dt} = -k(T - 75)$. Solve this differential equation (i.e., find a formula for $T(t)$) and answer the following questions.

(a) What is the temperature of the coffee after 17 minutes?

$T(17) =$ _____ degrees

(b) After how many minutes will the coffee be 100 degrees?

$t =$_____ minutes

5. (1 pt) alfredLibrary/AUCI/chapter7/lesson5/spring1pet.pg
A weight is attached to a horizontal spring that satisfies the differential equation

$$x'' = -0.01x$$

The units for x are centimeters, and the units for the independent variable t are seconds. Consider a "stretch" in the spring as a positive quantity, and a "compression" as a negative one.

Initially the spring is stretching at a rate of 5 cm/sec and is stretched 5 cm from equilibrium.

(a) Write the formula for the location of the weight at time t.

$x(t) =$ _____ cm

(b) Find the location of the weight 9 seconds after it is set in motion.

$x(9) =$ _____ cm