CALCULUS FINAL EXAM REVIEW CHAPTER 7

1. Solve the following differential equations with the given initial conditions.

a. $\frac{dy}{dx} = 2x - 1; (2, -1)$

b. $\frac{dy}{dx} = \frac{6x - x^3}{2y}; (0, 3)$

c. $\frac{dy}{dt} = t^2 y^4; (1, 1)$

2. Bacteria Problem: A bacterial population grows at a rate proportional to its size.

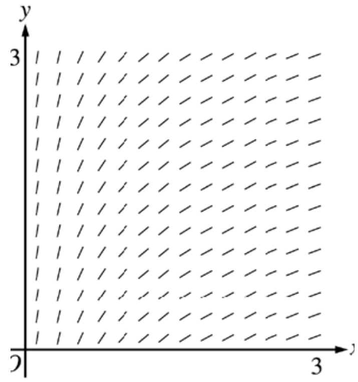
a. Write differential equations that expresses the relationship. Separate the variables and integrate the equation, solving for the number of bacteria as a function of time. B = bacteria in thousands; t = time in days

b. Suppose there are initially 10,000 bacteria and 10 days later there are 42,000. Write a particular equation that expresses the number of bacteria in thousands as a function of time in days.

c. What is the population after 25 days? How long will it take the population to double?

3. The solution to a differential equation is a ________________.

4. A slope field from a certain differential equation is shown below. Which of the following could be a specific solution to that differential equation?



(A) $y=x^2$

(B) $y=e^x$

(C) $y=e^{-x}$

(D) y= cos(x)

(E) y= lnx

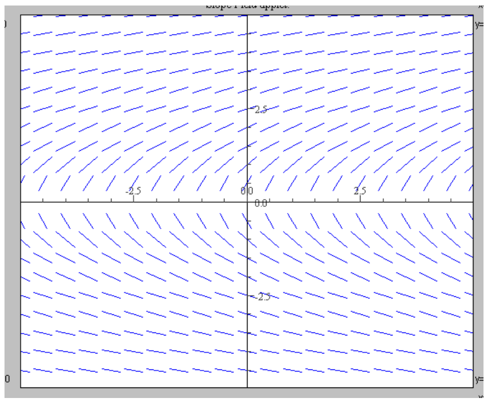
5. Match the slope field to the correct differential equation.

A) $\frac{dy}{dx}=2y(1-y)$

B) $\frac{dy}{dx}=3x^2+1$

C) $\frac{dy}{dx}=-2xy$

D) $\frac{dy}{dx}=\frac{1}{y}$



6. <u>Coffee Cup Problem</u>: When a cup of coffee is poured, its temperature is $130^\circ F$. Three minutes later, the temperature is now $117^\circ F$. As the coffee cools, the instanteous rate of change of the temperature, T, with respect to time in minutes is directly proportional.

(a) Write the general equation for this situation.

(b) Write the particular solution given the conditions.

(c) What will the temperature be after 15 minutes?

(d) When will the temperature reach $68^\circ F$?