Name: ______________________________ Date:______________ **Corrective Assignment**

Unit 7 CA – Differential Equations (BC)

1. The rate at which a project $p(x)$ is completed is proportional to the square root of the number of employees x working on the project, where p is measured as a percent of the project that has been completed. If 5 people can complete the project at a rate of 3% per day, what is a differential equation that models this situation?

Find the general solution of the differential equation.	
2. $\frac{dy}{dx} = (x+7)y$	3. $\frac{dy}{dx} = -xy^3$

4. A population y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the population doubles every 14 years, then what is the value of k?

5. A dose of 500 milligrams of a drug is administered to a patient. The amount of the drug, in milligrams, in the person's bloodstream at time t, in hours, is given by $A(t)$. The rate at which the drug leaves the bloodstream can be modeled by the differential equation $\frac{dA}{dt} = -0.8A$. Write an expression for $A(t)$.

6. Consider the differential equation $\frac{dy}{dx} = (1 - 2x)y$. If $y = 10$ when $x = 1$, find an equation for y.

(A) $y = e^{x-x^2}$

(B) $y = 10 + e^{x-x^2}$

(C) $y = e^{x-x^2+10}$

(D) $y = 10e^{x-x^2}$

(E) $y = x - x^2 + 10$

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7. The solution to the differential equation $\frac{dy}{dx} = \frac{x}{\cos y}$ with the initial condition $y(1) = 0$ is

(A) $y = \sin^{-1}\left(\frac{x^2-1}{2}\right)$

(B) $y = \sin^{-1}\left(\frac{x^2}{2}\right)$

(C) $y = \cos^{-1}(x^2 - 1)$

(D) $y = \ln[\cos(x - 1)]$

(E) $y = \ln(\sin x)$

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8. If $\frac{dy}{dx} = \frac{3x^2+2}{y}$ and $y = 4$ when $x = 2$, then when $x = 3$, $y =$

(A) 18

(B) $\pm\sqrt{66}$

(C) 58

(D) $\pm\sqrt{74}$

(E) $\pm\sqrt{58}$

For each differential equation, find the particular solution that passes through the given point.

9. $\frac{dy}{dx} = 9e^{3x} - \cos x;\ (0, 2)$

10. $\frac{dy}{dx} = 4y$ and $y = 8$ when $x = 0$

11. $\frac{d^2y}{dx^2} = \cos(2x) + 1$ and $y'(\pi) = 0$ and $y(0) = 1$

12. For what value of k, if any, is $y = e^{3x} + ke^{-4x}$ a solution to the differential equation $y'' - 3y' = 7e^{-4x}$?

13. The table below gives the values of f', the derivative of f. If $f(1.3) = 1.7$, what is the approximation to $f(2.2)$ obtained by using Euler's method with 3 steps of equal size?

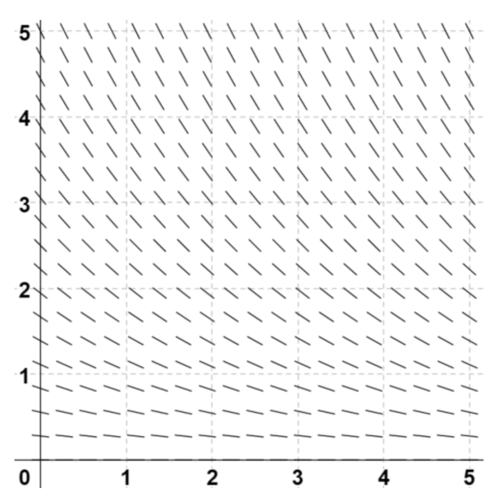
x	1.3	1.6	1.9	2.2
$f'(x)$	0.1	0.3	0.6	1.1

14. Let $y = f(x)$ be the solution to the differential equation $\frac{dy}{dx} = 2y - x$ with initial condition $f(1) = 3$. What is the approximation for $f(2)$ obtained using Euler's method with 2 steps of equal length, starting at $x = 1$?

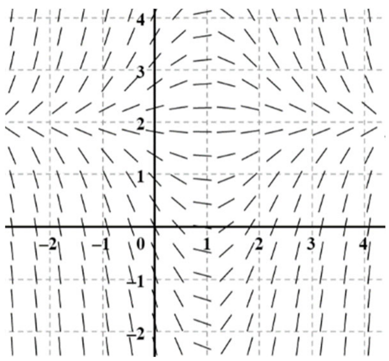
15. A populations rate of growth is modeled by the logistic differential equation $\frac{dP}{dt} = \frac{1}{1000}P(500 - P)$, where t is in weeks and $P(0) = 10$. What is the greatest rate of change for this population?

16. Using the logistic differential equation $\frac{dP}{dt} = 0.2P - 0.001P^2$, identify the carrying capacity.

17. Explain why the following slope field cannot represent the differential equation $\frac{dy}{dt} = 0.4y$



18.



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

(B) $\frac{dy}{dx} = 1 + x + y$

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

(D) $\frac{dy}{dx} = xy^2$

(E) $\frac{dy}{dx} = (x - 1)y^2$

Answers to Unit 7 Corrective Assignment (BC)

1. $\frac{dp}{dx} = 1.3416\sqrt{x}$	2. $y = Ce^{\frac{1}{2}x^2+7x}$	3. $y = \pm\sqrt{\frac{1}{x^2+C}}$	4. $k \approx 0.0495$	5. $A(t) = 500e^{-0.8t}$
6. D	7. A	8. E	9. $y = 3e^{3x} - \sin x - 1$	10. $y = 8e^{4x}$
11. $y = -\frac{1}{4}\cos(2x) + \frac{1}{2}x^2 - \pi x + \frac{5}{4}$	12. $k = \frac{1}{4}$	13. $f(2.2) = 2$	14. $f(2.0) \approx 10.25$	
15. 62.5/week	16. 200	17. $\frac{dy}{dx} > 0$ when $y > 0$, but the slope field shows line segments with negative slope.	18. C	