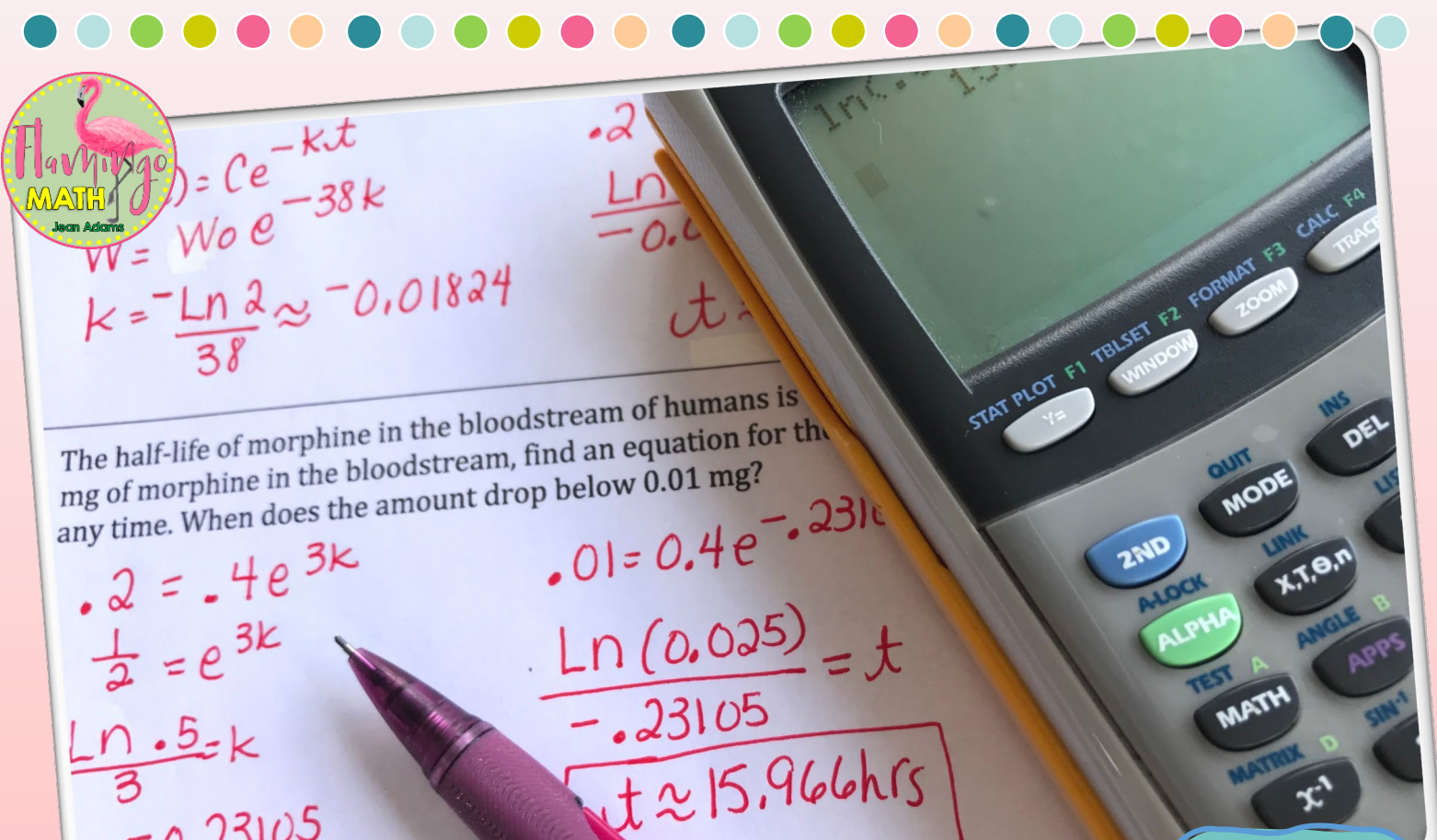
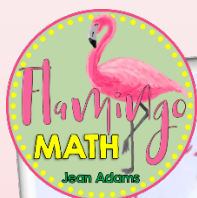


AP[®] Calculus-AB

Differential Equations



Homework

7

Completely Editable

AP CALCULUS AB CURRICULUM

Scope and Sequence

Unit 7: Differential Equations

Lesson	Skills & Learning Objectives
[7.1] Introduction to Differential Equations	☐ Interpret verbal statements to write differential equations and verify solutions.
[7.2] Slope Fields	☐ Use slope fields to approximate solutions of differential equations. ☐ Identify slope fields for differential equations ☐ Use initial conditions to find particular solutions of differential equations.
[7.3] Separation of Variables	☐ Use separation of variables to solve simple differential equations.
[7.4] Growth and Decay	☐ Use exponential functions to model growth and decay in applied problems.

Problems 1 – 8, Write a differential equation that describes each relationship.

- | | |
|---|--|
| 1. The rate of growth of a certain bacteria B , in a petri dish is proportional to the number of bacteria in the dish. | 2. An object moves along a straight line. Its speed S , is inversely proportional to the square of the distance S , the object traveled. |
| 3. Every month the balance, B , of Rachel's car loan increases by 4.5% and decreases by \$375.00. | 4. The fraction of the student body P , who has heard a rumor increases at a rate proportional to the fraction of the population who has not yet heard the rumor. |
| 5. The rate of growth of a population of grasshoppers is inversely proportional to the square root of the population. | 6. The rate of decay of a certain substance R , is inversely proportional to the amount of substance remaining. |
| 7. Your sweet potato casserole C , is removed from a hot oven. The room temperature of the kitchen is 75°F . The rate at which the casserole cools is proportional to the difference between the room temperature and the temperature of the casserole. | 8. Your swimming pool bacteria level is elevated and needs to be diluted by pumping fresh water into the pool and pumping out the bacteria ridden water. The volume of water in the pool at any time t is $2t + 15$. The amount of bacteria b , in the pool decreases at a rate proportional b and inversely proportional to the volume of water in the pool. |

7.2

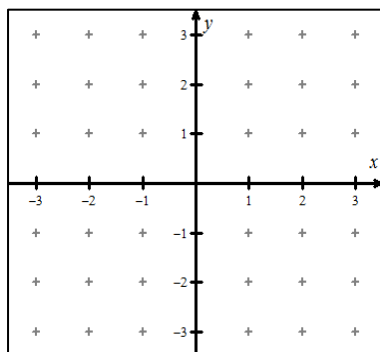
Sketching Slope Fields Homework

Name _____

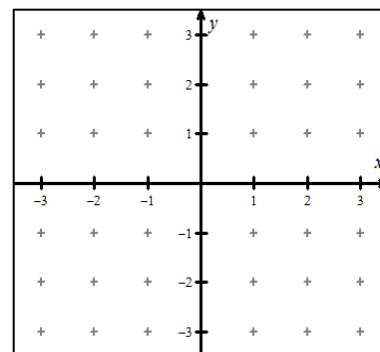
Date _____ Period _____

Problems 1 - 6, Draw slope fields for the following differential equations.

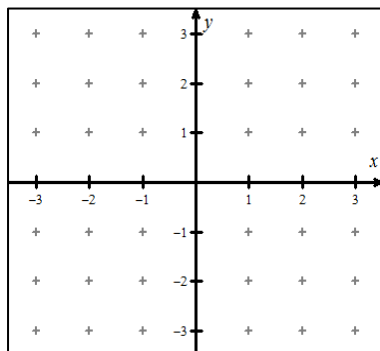
1. $\frac{dy}{dx} = \frac{1}{x}$



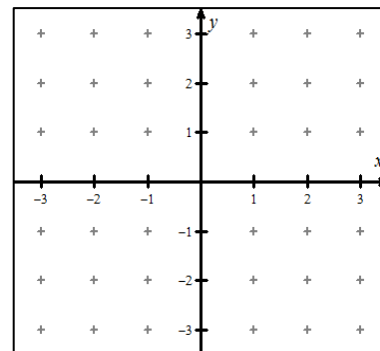
2. $\frac{dy}{dx} = \frac{1}{y}$



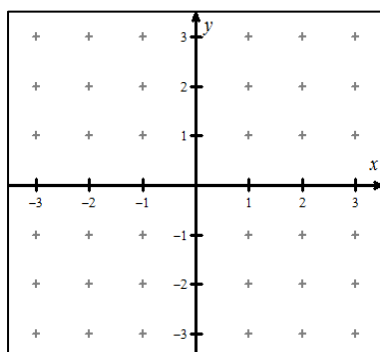
3. $\frac{dy}{dx} = \sin x$



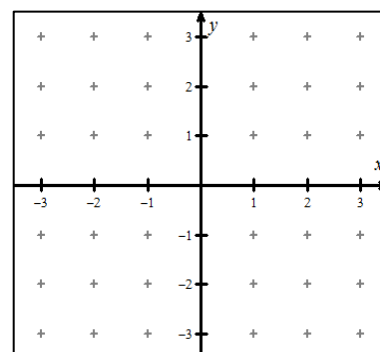
4. $\frac{dy}{dx} = 3x^2$



5. $\frac{dy}{dx} = y - 1$



6. $\frac{dy}{dx} = x - 1$



7.3**Separation of Variables
Homework**

Name _____

Date _____ Period _____

Problems 1 - 6, Find the solutions to the differential equations, subject to the given initial conditions.

1. $6x + 5y \frac{dy}{dx} = 0$, $y(3) = 2$. Write your answer in standard form: $Ax^2 + By^2 = C$.

2. $\frac{dy}{dx} = \frac{y}{2\sqrt{x}}$, $y(4) = 1$

3. $\frac{dy}{dx} = (y + 8)$, $y(0) = 4$

4. $e^x - y \frac{dy}{dx} = 0$, $y(0) = 3$

7.4**Growth and Decay
Homework**

Name _____

Date _____ Period _____

-
1. Write and solve the differential equation that models the following statement, "The rate of change of W with respect to x is proportional to $x + 18$."
-
2. In 10 years, the mass of a 200-gram sample of an element is reduced to 100 grams; this is the half-life of the element. Find k for this element.
-
3. Newtonium (Nt) is a highly radioactive element with a half-life of 625 years. How long would it take 62 grams to decay to 22 grams? (Round your answer to the nearest year.)