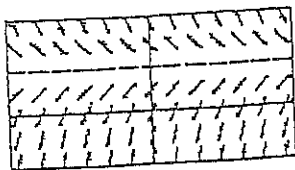


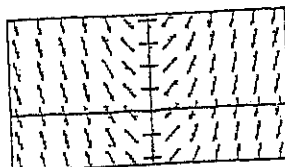
Name: \_\_\_\_\_

Match the slope fields with their differential equations.

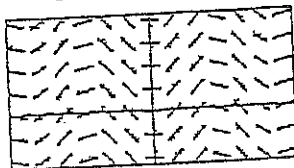
(A)



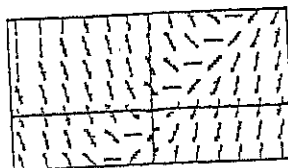
(B)



(C)



(D)



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

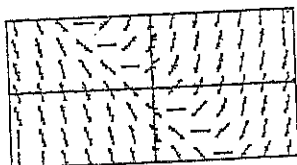
8.  $\frac{dy}{dx} = x - y$

9.  $\frac{dy}{dx} = 2 - y$

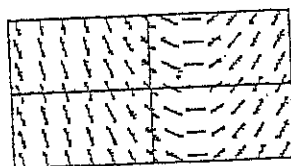
10.  $\frac{dy}{dx} = x$

Match the slope fields with their differential equations.

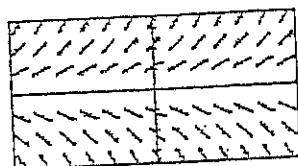
(A)



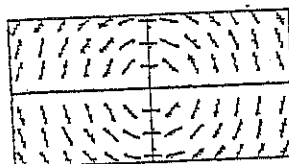
(B)



(C)



(D)



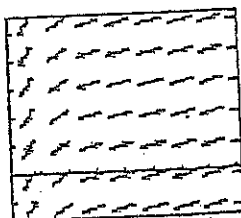
11.  $\frac{dy}{dx} = .5x - 1$

12.  $\frac{dy}{dx} = .5y$

13.  $\frac{dy}{dx} = -\frac{x}{y}$

14.  $\frac{dy}{dx} = x + y$

15. (From the AP Calculus Course Description)



The slope field from a certain differential equation is shown above. 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)  $y = \ln x$

## SOLUTIONS TO DIFFERENTIAL EQUATIONS AND DOMAIN

Find the particular solution  $y = f(x)$  to the differential equation with the given initial condition and state its domain.

$$1) \quad \frac{dy}{dx} = \frac{3x^2}{e^{2y}} \quad y(0) = \frac{1}{2}$$

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

$$3) \quad \frac{dy}{dx} = \frac{1}{x} \quad y(1) = 4$$

$$4) \quad \frac{dy}{dx} = \frac{1}{3y^2} \quad y(1) = 1$$

$$5) \quad \frac{dy}{dx} = \frac{4x}{y} \quad y(2) = -2$$

Differential Equations;

(From the AP Calculus Workshop Manual 04 – 05)

Example 1:

Find all the values of  $p$  so that  $y = x^p$  is a solution to the differential equation  $3x \frac{dy}{dx} = y$

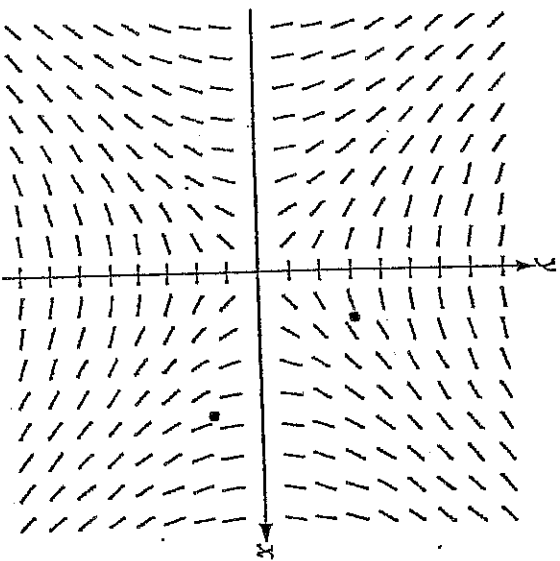
Find all the values of  $B$  so that  $y = \sqrt{Bx+3}$  is a solution to  $\frac{dy}{dx} = \frac{5}{y}$ .

Find all the values of  $A$  so that  $y = 7e^{ax}$  is a solution to  $\frac{d^2y}{dx^2} = 9y$

5. Consider the differential equation  $\frac{dy}{dx} = \frac{x}{y}$ , where  $y \neq 0$ .

- (a) The slope field for the given differential equation is shown below. Sketch the solution curve that passes through the point  $(3, -1)$ , and sketch the solution curve that passes through the point  $(1, 2)$ .

(Note: The points  $(3, -1)$  and  $(1, 2)$  are indicated in the figure.)

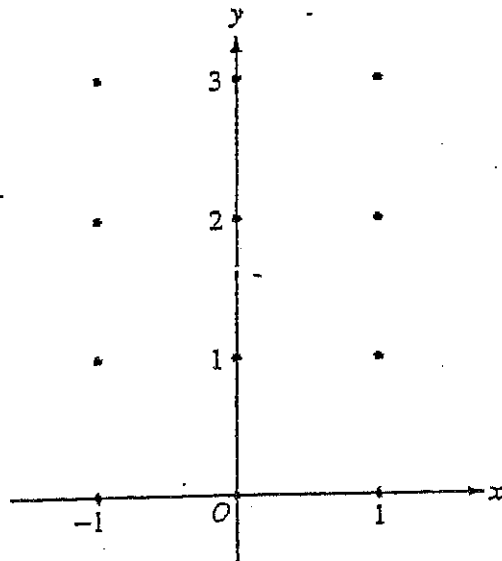


- (b) Write an equation for the line tangent to the solution curve that passes through the point  $(1, 2)$ .
- (c) Find the particular solution  $y = f(x)$  to the differential equation with the initial condition  $f(3) = -1$ , and state its domain.

2004 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS

6. Consider the differential equation  $\frac{dy}{dx} = x^2(y - 1)$ .

- (a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated.  
(Note: Use the axes provided in the pink test booklet.)

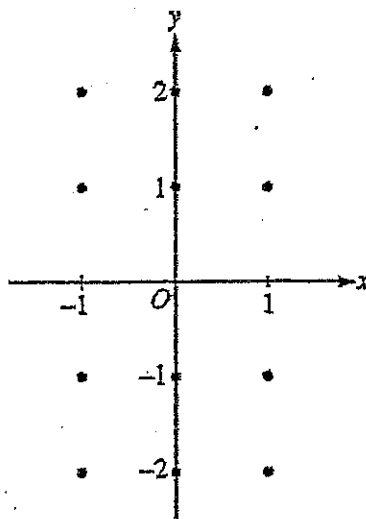


- (b) While the slope field in part (a) is drawn at only twelve points, it is defined at every point in the  $xy$ -plane. Describe all points in the  $xy$ -plane for which the slopes are positive.
- (c) Find the particular solution  $y = f(x)$  to the given differential equation with the initial condition  $f(0) = 3$ .

2005 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS

6. Consider the differential equation  $\frac{dy}{dx} = -\frac{2x}{y}$ .

- (a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated.  
(Note: Use the axes provided in the pink test booklet.)

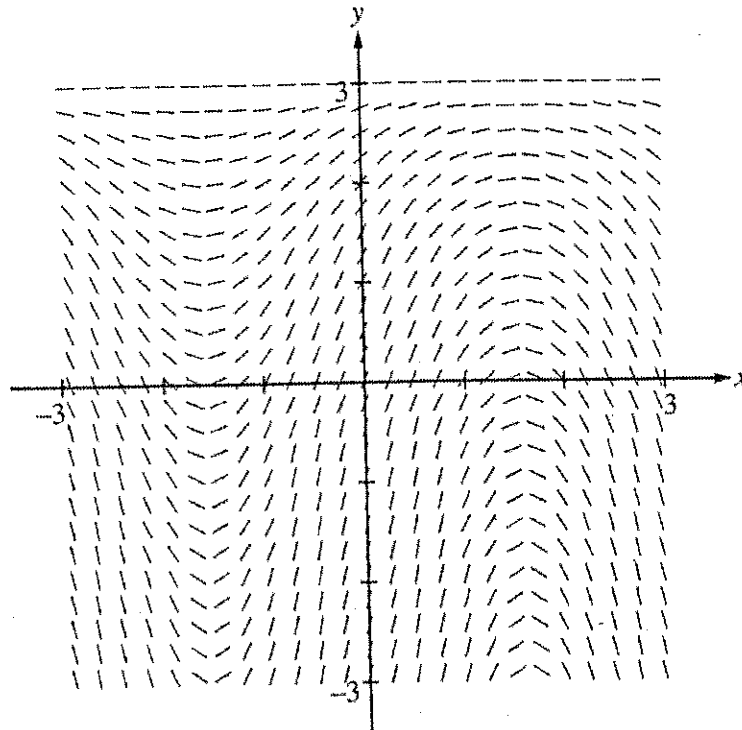


- (b) Let  $y = f(x)$  be the particular solution to the differential equation with the initial condition  $f(1) = -1$ . Write an equation for the line tangent to the graph of  $f$  at  $(1, -1)$  and use it to approximate  $f(1.1)$ .
- (c) Find the particular solution  $y = f(x)$  to the given differential equation with the initial condition  $f(1) = -1$ .

**2014 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS**

6. Consider the differential equation  $\frac{dy}{dx} = (3 - y)\cos x$ . Let  $y = f(x)$  be the particular solution to the differential equation with the initial condition  $f(0) = 1$ . The function  $f$  is defined for all real numbers.

(a) A portion of the slope field of the differential equation is given below. Sketch the solution curve through the point  $(0, 1)$ .



(b) Write an equation for the line tangent to the solution curve in part (a) at the point  $(0, 1)$ . Use the equation to approximate  $f(0.2)$ .

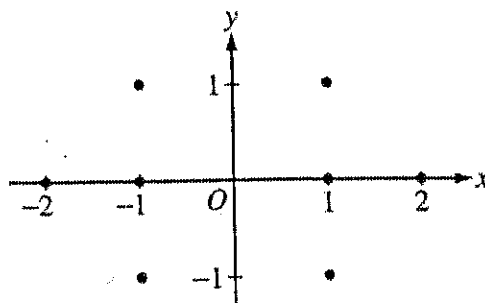
(c) Find  $y = f(x)$ , the particular solution to the differential equation with the initial condition  $f(0) = 1$ .

**2006 AP<sup>®</sup> CALCULUS AB FREE-RESPONSE QUESTIONS**

5. Consider the differential equation  $\frac{dy}{dx} = \frac{1 + y}{x}$ , where  $x \neq 0$ .

(a) On the axes provided, sketch a slope field for the given differential equation at the eight points indicated.

(Note: Use the axes provided in the pink exam booklet.)



(b) Find the particular solution  $y = f(x)$  to the differential equation with the initial condition  $f(-1) = 1$  and