

## AP® Exam Practice Questions

See LarsonCalculus.com for worked-out solutions to these questions.

## What You Need to Know

- You may have to sketch a slope field for a given differential equation at a specified number of points.
- Given a slope field, you may be asked to sketch a solution curve through a point. When sketching the curve, make sure that it follows the slope field appropriately and passes through the indicated point.

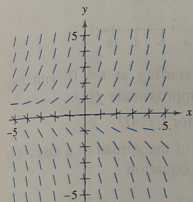
## Practice Questions

## Section 1, Part A, Multiple Choice, No Technology

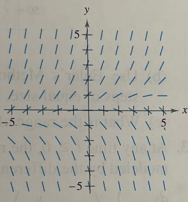
1. Which figure is a slope field for the differential equation

$$\frac{dy}{dx} = y - \frac{x}{5}$$

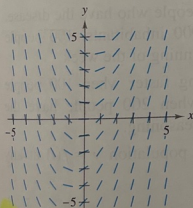
(A)



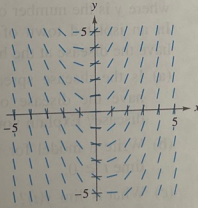
(B)



(C)



(D)



2. A population
- $P$
- grows according to the equation

$$\frac{dP}{dt} = kP$$

where  $k$  is a constant and  $t$  is measured in years. If the population triples every 15 years, what is the value of  $k$ ?

- (A)  $\ln \frac{1}{5}$  (B)  $\frac{1}{15} \ln 3$   
 (C)  $\ln 3$  (D) 5

3. Let
- $y = f(x)$
- be a solution of the differential equation
- $y' = ky$
- , where
- $k$
- is a constant. If
- $f(0) = 8$
- and
- $f(6) = 2$
- , which of the following is an expression for
- $f(x)$
- ?

- (A)  $8e^{(x/6)\ln(1/4)}$  (B)  $-e^{(x/6)\ln 7} + 9$   
 (C)  $-x + 8$  (D)  $x^2 + 8$

4. For
- $dy/dx = 2xy^2$
- and
- $y(-1) = 2$
- , find
- $y(2)$
- .

- (A)  $-4e^3$  (B)  $-\frac{3}{2}$   
 (C)  $-\frac{2}{5}$  (D)  $-\frac{1}{4}$

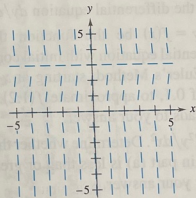
5. Which of the following is the solution of the differential equation

$$\frac{dy}{dx} = \frac{3y}{x}$$

with the initial condition  $y(1) = -1$ ?

- (A)  $y = x^3$  (B)  $y = -x^3$   
 (C)  $y = x^3 - 2$  (D)  $y = -x^3 - 2$

6. Which of the following differential equations produces the slope field shown below?



- (A)  $\frac{dy}{dx} = 10y\left(1 - \frac{y}{3}\right)$  (B)  $\frac{dy}{dx} = \frac{y}{2}\left(1 - \frac{y}{3}\right)$   
 (C)  $\frac{dy}{dx} = y\left(1 - \frac{y}{3}\right)$  (D)  $\frac{dy}{dx} = 5y\left(1 - \frac{y}{6}\right)$

## Section 1, Part B, Multiple Choice, Technology Permitted

7. Consider the differential equation

$$y' = 0.5(y - 1)(t + 1)$$

with an initial value of  $y(0) = -3$ . Using Euler's Method with a step of  $h = \frac{1}{5}$ , what is the approximate value of  $y(1)$ ?

- (A)  $-6.288$  (B)  $-6.125$   
 (C)  $-4.753$  (D)  $-4.703$