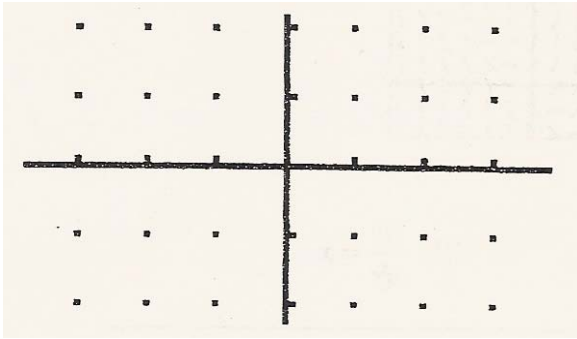


Slope Fields

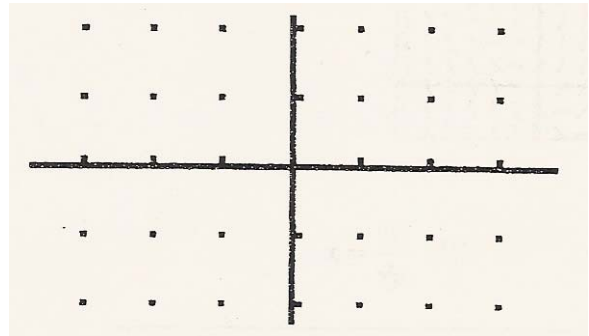
Nancy Stephenson
Clements High School
Sugar Land, Texas

Draw a slope field for each of the following differential equations. Each tick mark is one unit.

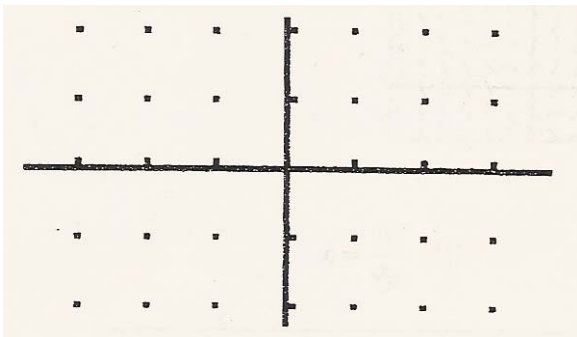
1. $\frac{dy}{dx} = x + 1$



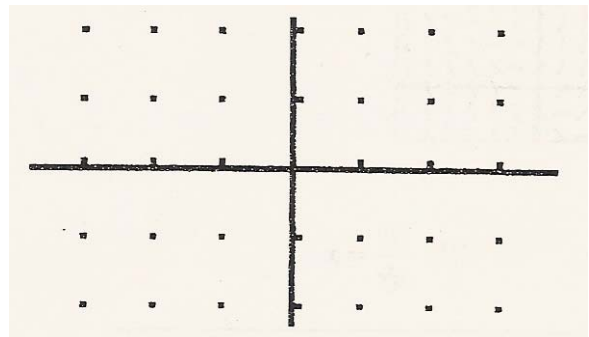
2. $\frac{dy}{dx} = 2y$



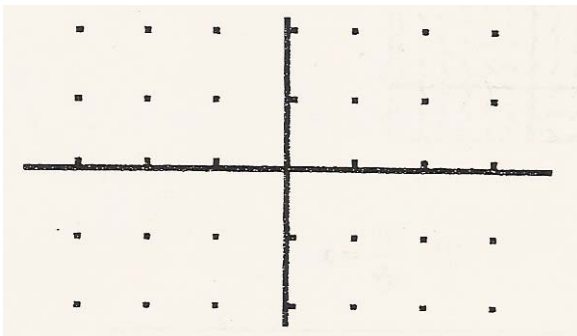
3. $\frac{dy}{dx} = x + y$



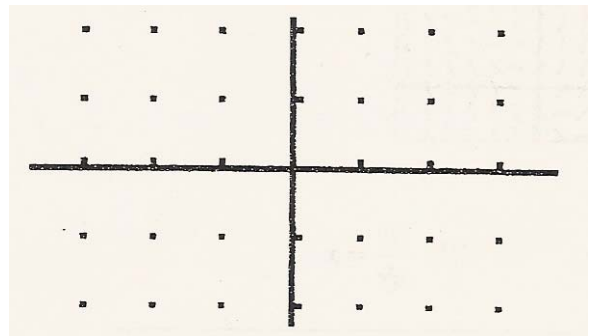
4. $\frac{dy}{dx} = 2x$



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

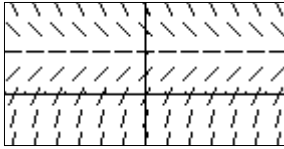


6. $\frac{dy}{dx} = -\frac{y}{x}$

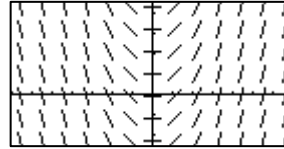


Match the slope fields with their differential equations.

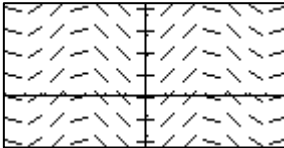
(A)



(B)



(C)



(D)



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

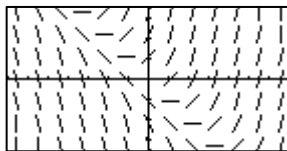
8. $\frac{dy}{dx} = x - y$

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

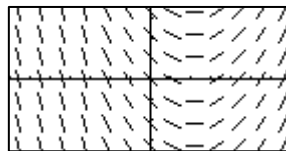
10. $\frac{dy}{dx} = x$

Match the slope fields with their differential equations.

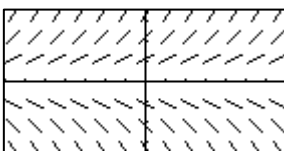
(A)



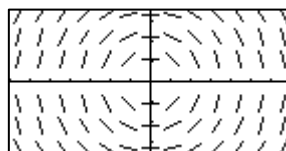
(B)



(C)



(D)



11. $\frac{dy}{dx} = 0.5x - 1$

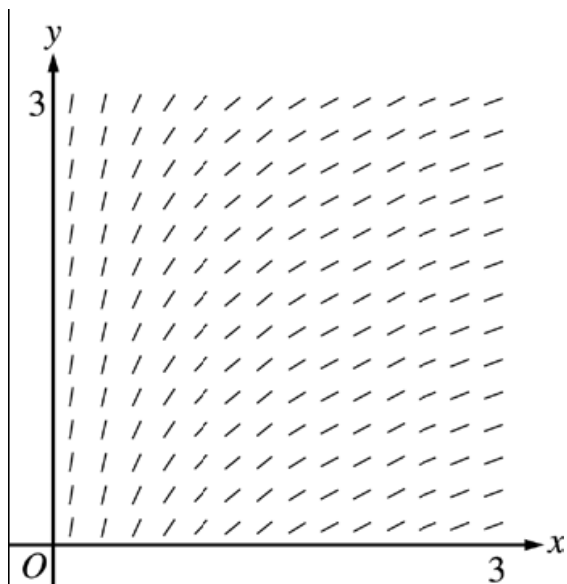
12. $\frac{dy}{dx} = 0.5y$

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

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

From the May 2008 AP Calculus Course Description:

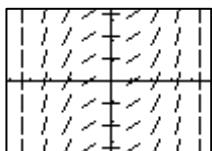
15.



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) $y = \ln x$

16.



The slope field for a certain differential equation is shown above. Which of the following could be a specific solution to that differential equation?

- (A) $y = \sin x$ (B) $y = \cos x$ (C) $y = x^2$ (D) $y = \frac{1}{6}x^3$ (E) $y = \ln x$
-

17. Consider the differential equation given by $\frac{dy}{dx} = \frac{xy}{2}$.

(A) On the axes provided, sketch a slope field for the given differential equation.



(B) Let f be the function that satisfies the given differential equation. Write an equation for the tangent line to the curve $y = f(x)$ through the point $(1, 1)$. Then use your tangent line equation to estimate the value of $f(1.2)$.

(C) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(1) = 1$. Use your solution to find $f(1.2)$.

(D) Compare your estimate of $f(1.2)$ found in part (b) to the actual value of $f(1.2)$ found in part

(E) Was your estimate from part (b) an underestimate or an overestimate? Use your slope field to explain why.

18. Consider the differential equation given by $\frac{dy}{dx} = \frac{x}{y}$.

(A) On the axes provided, sketch a slope field for the given differential equation.



(B) Sketch a solution curve that passes through the point $(0, 1)$ on your slope field.

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

(D) Sketch a solution curve that passes through the point $(0, -1)$ on your slope field.

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

Slope Fields Worksheet Solutions

7. C

8. D

9. A

10. B

11. B

12. C

13. D

14. A

15. E

16. D

17. (B) Tangent line: $y - 1 = \frac{1}{2}(x - 1)$

$$f(1.2) \approx 1.1$$

$$(C) y = e^{\frac{x^2-1}{4}}$$

$$f(1.2) = 1.116$$

(D) The estimate from part (b) was an underestimate. Since the graph of $y = e^{\frac{x^2-1}{4}}$ is concave up, the tangent line found in part (b) lies below the curve.

$$18. (C) y = \sqrt{x^2 + 1}$$

$$(E) y = -\sqrt{x^2 + 1}$$