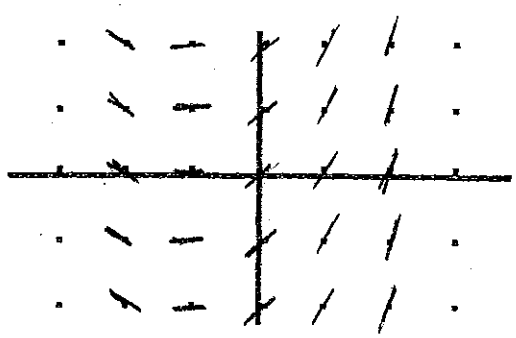
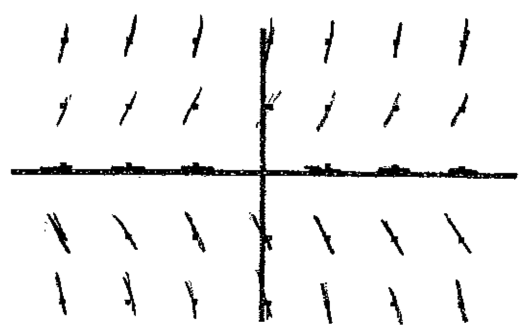
Slope Fields

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

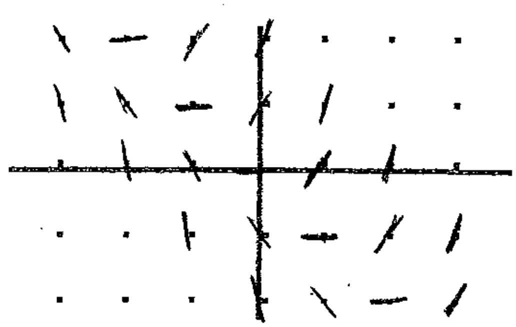
1. $\dfrac{dy}{dx} = x+1$



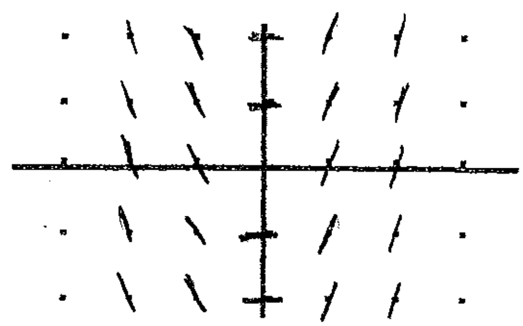
2. $\dfrac{dy}{dx} = 2y$



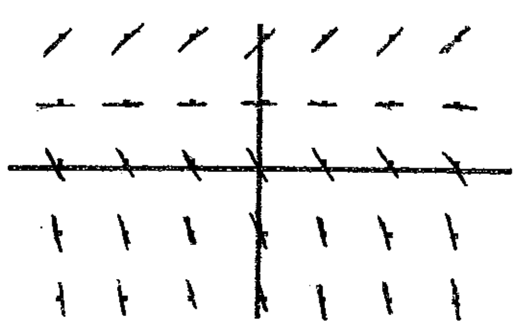
3. $\dfrac{dy}{dx} = x+y$



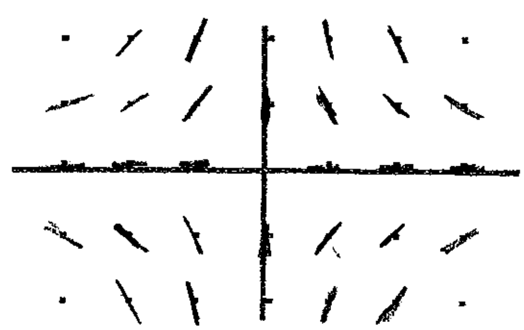
4. $\dfrac{dy}{dx} = 2x$



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

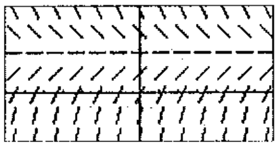


6. $\dfrac{dy}{dx} = -\dfrac{y}{x}$

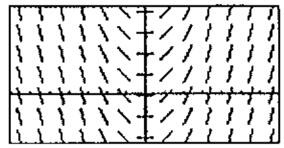


Match the slope fields with their differential equations.

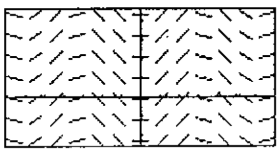
(A)



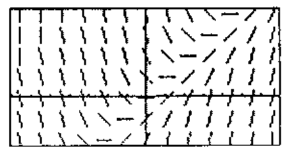
(B)



(C)



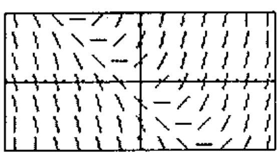
(D)



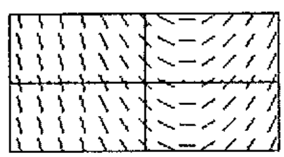
7. $\dfrac{dy}{dx} = \sin x$ C 8. $\dfrac{dy}{dx} = x - y$ D 9. $\dfrac{dy}{dx} = 2 - y$ A 10. $\dfrac{dy}{dx} = x$ B

Match the slope fields with their differential equations.

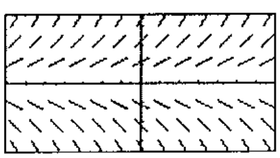
(A)



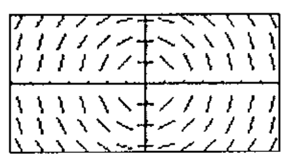
(B)



(C)

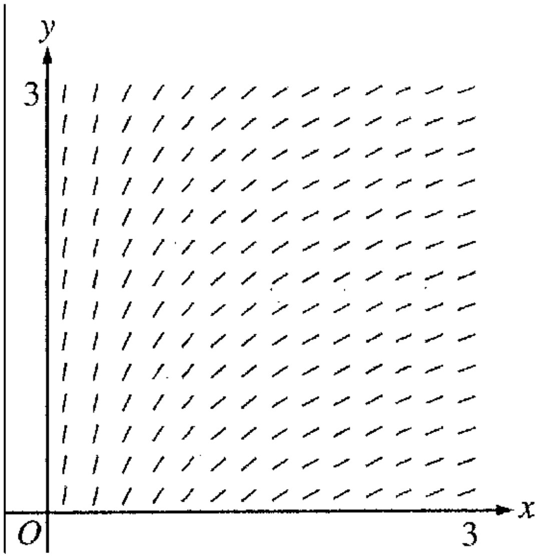


(D)



11. $\dfrac{dy}{dx} = 0.5x - 1$ B 12. $\dfrac{dy}{dx} = 0.5y$ C 13. $\dfrac{dy}{dx} = -\dfrac{x}{y}$ D 14. $\dfrac{dy}{dx} = x + y$ A

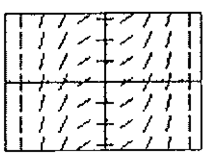
15.



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.



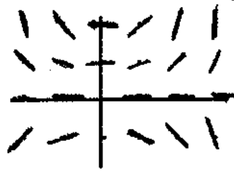
The slope field for a certain differential equation is shown above. Which of the following could be a specific solution to that differential equation?

(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 $\frac{dy}{dx} = \frac{xy}{2}$.

$\frac{dy}{dx} = \frac{1 \cdot 1}{2} = \frac{1}{2}$

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



$\frac{dy}{y} = \frac{1}{2} x \, dx$

$\ln y = \frac{1}{4}x^2 + C$

$y = Ce^{\frac{1}{4}x^2}$ $\quad 1 = Ce^{1/4}$ $\quad C = e^{-1/4}$

(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 $f(1.2)$.

$y - 1 = \frac{1}{2}(x - 1) \Rightarrow y = 1.1$

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

$y = e^{-1/4} \cdot e^{1/4 x^2}$ $\quad y = 1.116$

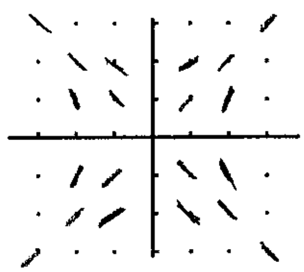
(D) Compare your estimate of $f(1.2)$ found in part (b) to the actual value of $f(1.2)$ found in part

(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.



$\int y \, dy = \int x \, dx$

$\frac{1}{2}y^2 = \frac{1}{2}x^2 + C$

$y^2 - x^2 = C$

(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 $f(0) = 1$.

$\frac{1}{2}y^2 - \frac{1}{2}x^2 = \frac{1}{2} \quad = \quad y^2 - x^2 = 1$

(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 $f(0) = -1$.

$\frac{1}{2}y^2 - \frac{1}{2}x^2 = -\frac{1}{2}$

$y^2 - x^2 = 1$