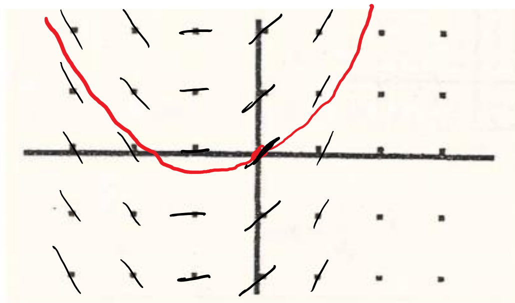
9.3 Slopefields_worksheet_ORIGINAL

Friday, February 15, 2019 9:25 AM

9.3 Slopefields_worksheet_ORIGINAL

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

1. $\frac{dy}{dx} = x+1$ $y(0)=0$



2. $\frac{dy}{dx} = 2y$ $y(0)=1$

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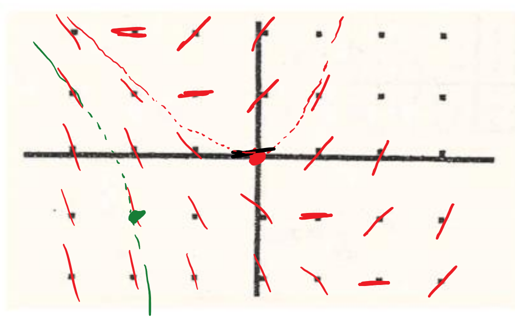
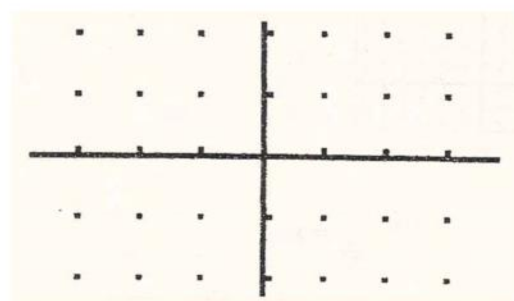
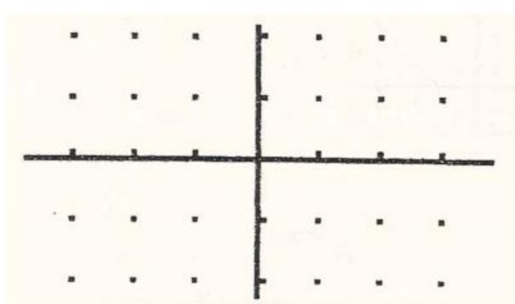
3. $\frac{dy}{dx} = x+y$



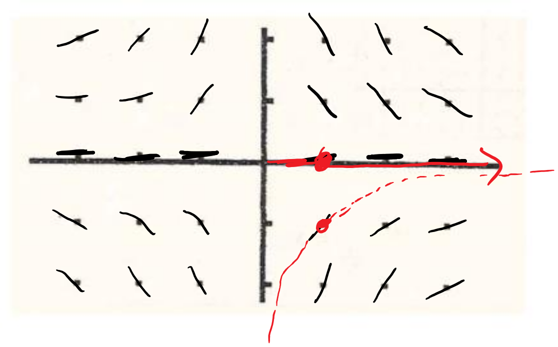
4. $\frac{dy}{dx} = 2x$



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

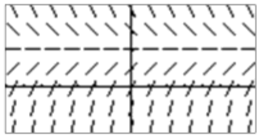


6. $\frac{dy}{dx} = -\frac{y}{x}$

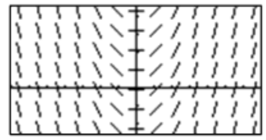


Match the slope fields with their differential equations.

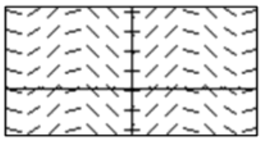
(A)



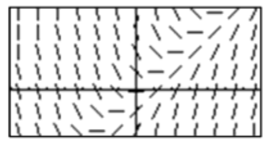
(B)



(C)



(D)



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

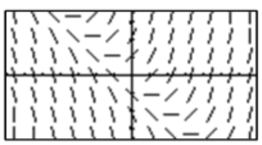
8. $\frac{dy}{dx} = -xy$

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

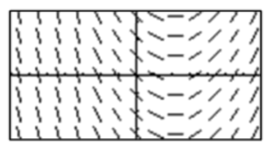
10. $\frac{dy}{dx} = x$

Match the slope fields with their differential equations.

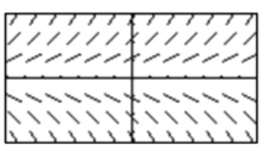
(A)



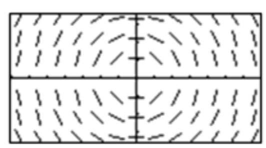
(B)



(C)



(D)



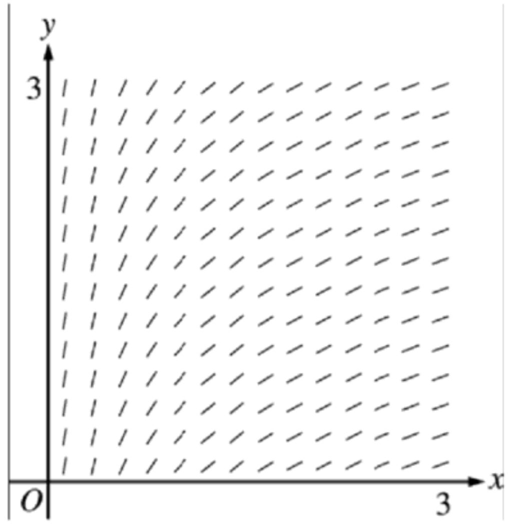
11. $\frac{dy}{dx} = 0.5x - 1$

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

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

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

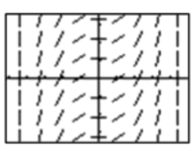
From the May 2008 *AP Calculus Course Description:*
15.



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.

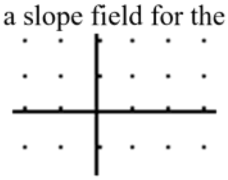


The slope field for a certain differential equation is shown above. Which of the following could be a specific solution to that differential equation?

(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.

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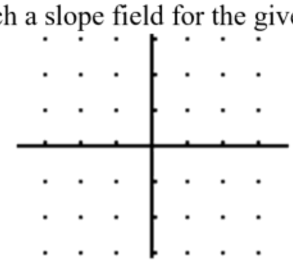
18. Consider the differential equation given by $\frac{dy}{dx} = \frac{x}{y}$.

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

$$y_{new} = y_{old} + \Delta t \cdot \frac{\Delta y}{\Delta t}$$

$\Delta t = h$, $\frac{\Delta y}{\Delta t} = \text{slope}$

$$y_{new} = y_{old} + \Delta y$$