TOPIC: SLOPE FIELDS

Understanding Slope Fields

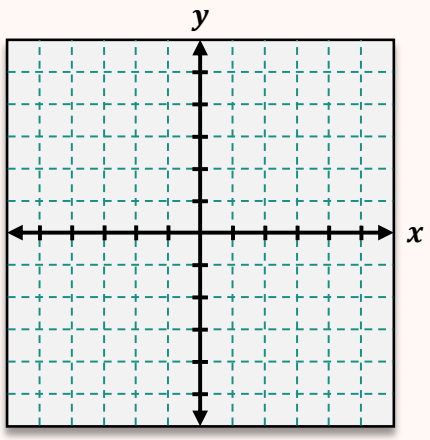
◆ Slope fields (direction fields) show the *shape* of possible _____ of a first-order DE in the form $y' = f(x, y)$.

► To draw a slope field, sketch short line segments at all points (x, y) w/ slopes found by plugging (x, y) into ___.

EXAMPLE $(\boldsymbol{A})$ Sketch a slope field for the differential equation $y' = x - y$. $(\boldsymbol{B})$ Use the slope field to sketch the particular solution that passes through $(-1,2)$ & the particular solution that passes through $(1, -2)$.

New **Slope Fields**

x	y	$y' = x - y$
1	0	$1 - 0 =$ _____
1	1	$1 - 1 =$ _____
1	2	
2	0	
2	1	
2	2	



◆ Sketch a *particular* solution curve through the _____ condition that follows along the _____.

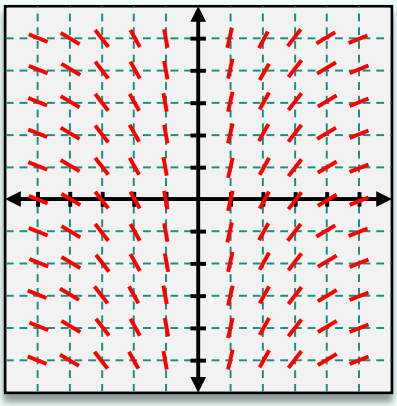
EXAMPLE Which of the following differential equations is represented by the slope field given?

$(\boldsymbol{A})\ \dfrac{dy}{dx} = 3 - x$

$(\boldsymbol{B})\ \dfrac{dy}{dx} = \sin(2x)$

$(\boldsymbol{C})\ \dfrac{dy}{dx} = \dfrac{1}{2}\cos x$

$(\boldsymbol{D})\ \dfrac{dy}{dx} = \dfrac{1}{x}$



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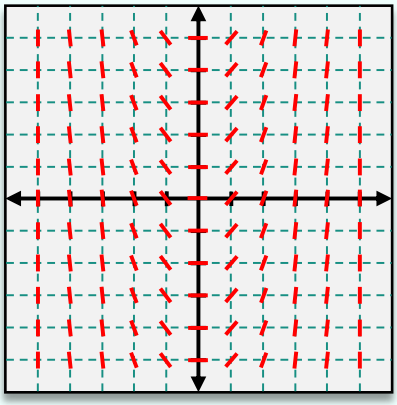
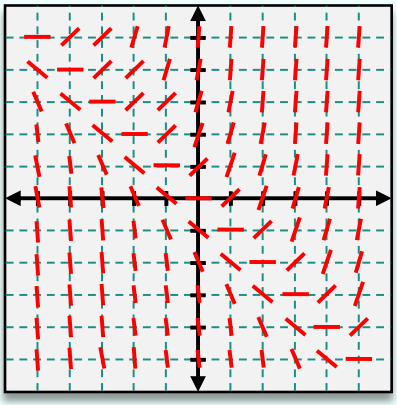
EXAMPLE Match the slope field to its differential equation.

$(\boldsymbol{A})\ y' = x + y$ $(\boldsymbol{B})\ y' = 2x$ $(\boldsymbol{C})\ y' = -\frac{x}{y}$

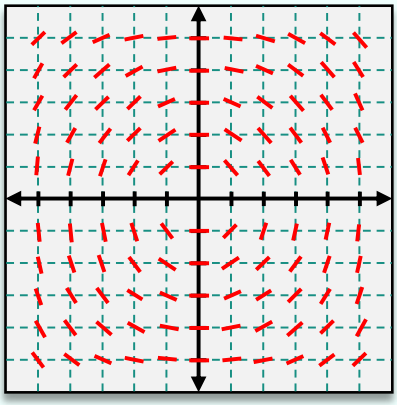
$(\mathbf{1})$



$(\mathbf{2})$

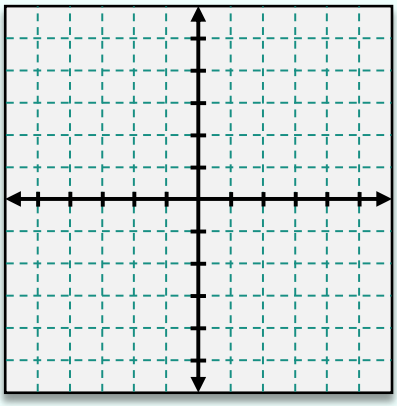


$(\mathbf{3})$



EXAMPLE Sketch a slope field for the following differential equation and then sketch the particular solution curve through the given initial condition.

$\frac{dy}{dx} = y - 1;\ (-1,0)$



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PRACTICE Sketch a slope field for the following differential equation through the nine points shown on the graph.

$y' = y - xy$