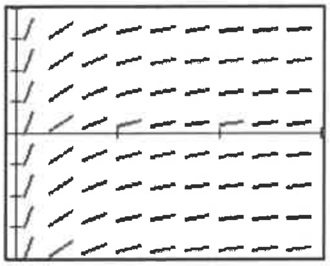
The slope field from a certain differential equation is shown for each problem. For each, identify either the differential equation OR particular solution that is associated with that slope field.

1.



(A) $y = \ln x$

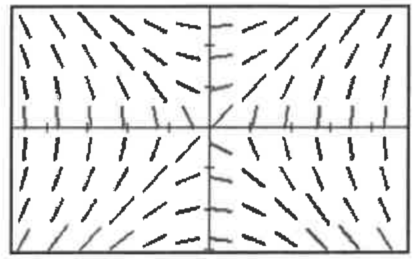
(B) $y = e^{x}$

(C) $y = e^{-x}$

(D) $y = \cos x$

(E) $y = x^2$

2.



(A) $\frac{dy}{dx} = x + y$

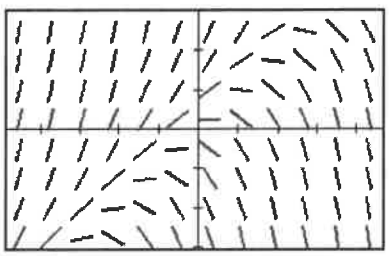
(B) $\frac{dy}{dx} = \frac{x}{y}$

(C) $\frac{dy}{dx} = \frac{y}{x}$

(D) $\frac{dy}{dx} = (x-1)y$

(E) $\frac{dy}{dx} = x(y-1)$

3.



(A) $\frac{dy}{dx} = y - x$

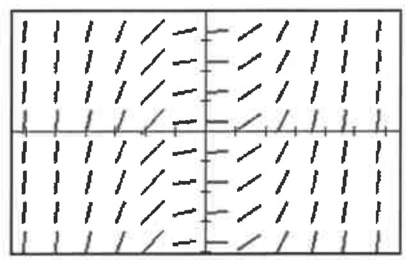
(B) $\frac{dy}{dx} = -\frac{x}{y}$

(C) $\frac{dy}{dx} = -\frac{y}{x}$

(D) $\frac{dy}{dx} = y(x-1)$

(E) $\frac{dy}{dx} = x(y-1)$

4.



(A) $y = \sin x$

(B) $y = \cos x$

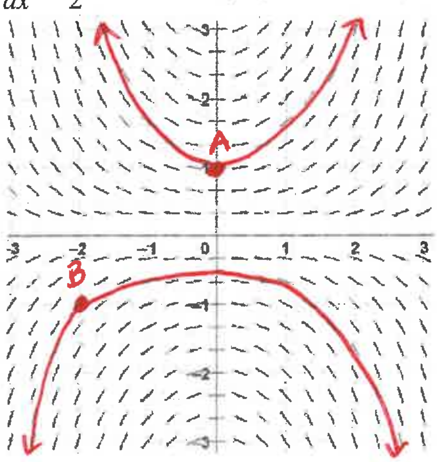
(C) $y = x^2$

(D) $y = \frac{1}{6}x^3$

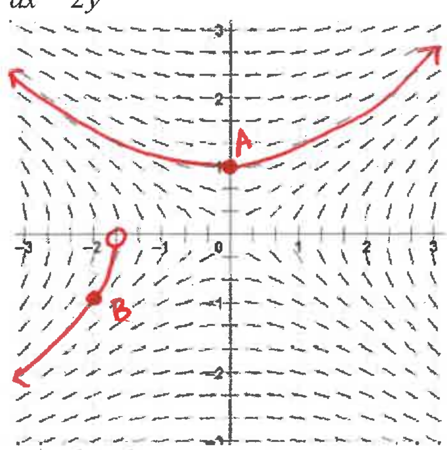
(E) $y = \frac{1}{4}x^4$

For each slope field, plot and label the points A and B and sketch the particular solution that passes through each of those points. (Two solutions for each slope field.)

5. $\frac{dy}{dx} = \frac{xy}{2}$; Point A: $(0,1)$; Point B: $(-2,-1)$



6. $\frac{dy}{dx} = \frac{x}{2y}$; Point A: $(0,1)$; Point B: $(-2,-1)$

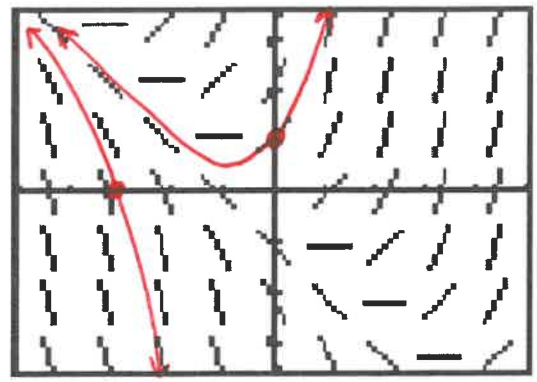


7. The slope field for the differential equation $\frac{dy}{dx} = x + y$ is shown in the figure to the right.

a) Sketch the solution curve through the point $(0,1)$.

b) Sketch the solution curve through the point $(-3,0)$.

c) Use the tangent line to the curve $y = f(x)$ at the point $(-3,0)$ to approximate $y(-3.1)$



point	slope
$(-3,0)$	$\left.\frac{dy}{dx}\right\vert_{(-3,0)} = -3+0 = -3$

$$y - 0 = -3(x+3)$$

$$L(x) = -3(x+3)$$

$$L(-3.1) = -3(-3.1+3) = -3(-0.1) = 0.3$$

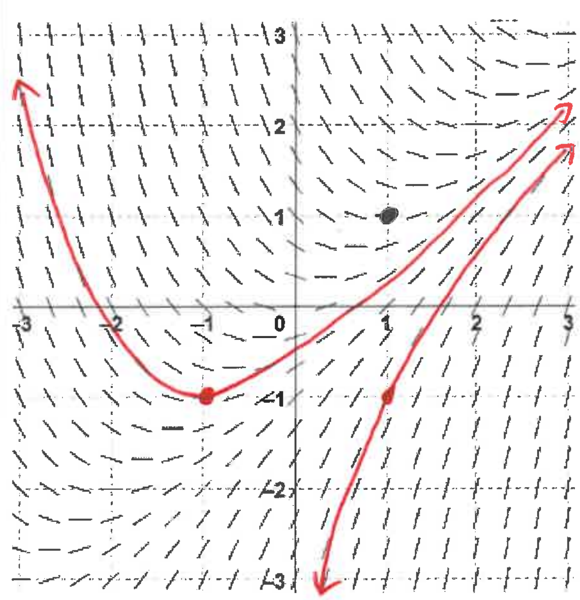
$$\boxed{y(-3.1) \approx 0.3}$$

8. The slope field for the differential equation $\frac{dy}{dx} = x - y$ is shown in the figure to the right.

a) Sketch the graph of the particular solution that contains $(-1,-1)$.

b) Sketch the graph of the particular solution that contains $(1,-1)$.

c) State a point, other than the origin, where $\frac{dy}{dx} = 0$. Find $\frac{d^2y}{dx^2}$ and use it to verify if your point is a local max or min.



$\frac{dy}{dx} = 0$ @ $(1,1)$

$$\frac{d^2y}{dx^2} = 1 - \frac{dy}{dx}$$

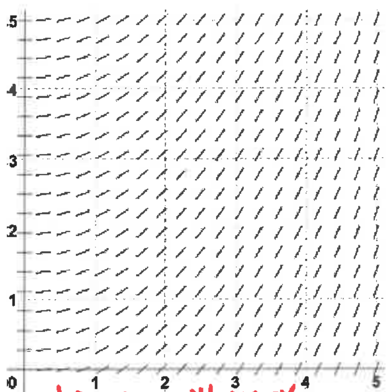
At $(1,1)$

$$\frac{d^2y}{dx^2} = 1 - 0 = 1 > 0$$

Since $\frac{dy}{dx} = 0$ & $\frac{d^2y}{dx^2} > 0 \rightarrow$ y has a min @ $(1,1)$

For each problem below a slope field and a differential equation are given. Explain why the slope field CANNOT represent the differential equation.

9. $\frac{dy}{dt} = 0.5y$

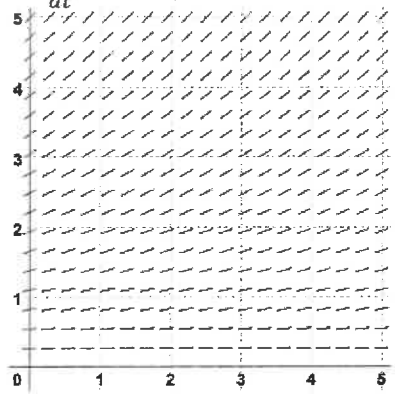


Explanations will vary!

when $y=4$, $\frac{dy}{dt}=2$ for all x.

The slope field shows varying $\frac{dy}{dt}$ values when $y=4$.

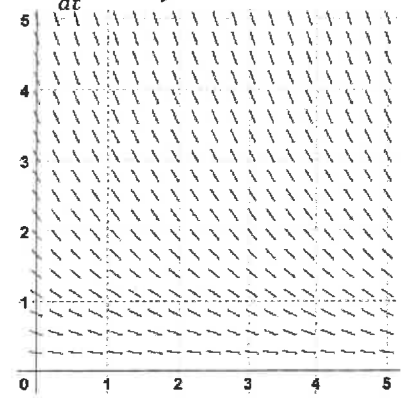
10. $\frac{dy}{dt} = -0.2y$



In Quad I, $\frac{dy}{dt}<0$.

The slope field shows positive slopes in Quad I.

11. $\frac{dy}{dt} = 0.6y$

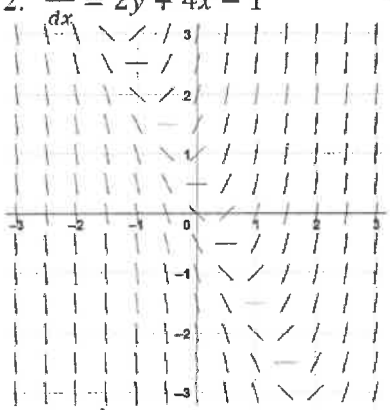


If $\frac{dy}{dt}=0.6y$, then in Quad I, $\frac{dy}{dt}>0$.

However, the slope field shows all negative slopes in Quad I.

Consider the differential equation and its slope field. Describe all points in the xy-plane that match the given condition.

12. $\frac{dy}{dx} = 2y + 4x - 1$



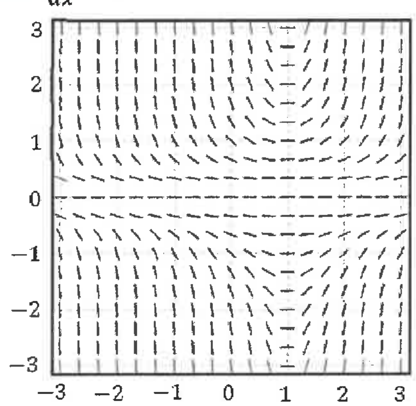
When is $\frac{dy}{dx}$ positive?

$\frac{dy}{dx}>0$ when $2y+4x-1>0$

$2y > -4x+1$

$y > -2x+\frac{1}{2}$

13. $\frac{dy}{dx} = y^2(x-1)$

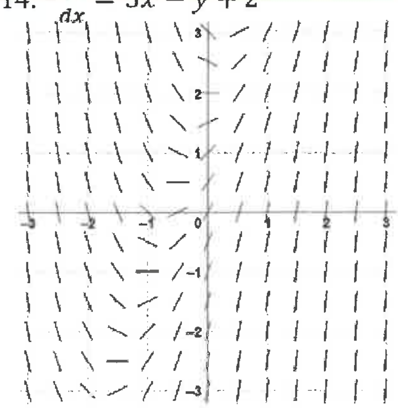


When are the slopes nonnegative?

$\frac{dy}{dx} \geq 0$ when

$x \geq 1$

14. $\frac{dy}{dx} = 3x - y + 2$



When does $\frac{dy}{dx} = 1$?

$\frac{dy}{dx} = 3x-y+2 = 1$

$-y = -3x-1$

when $y = 3x+1$