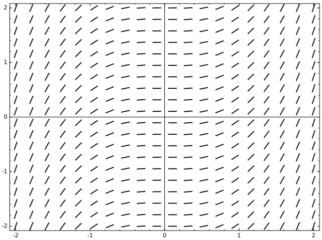
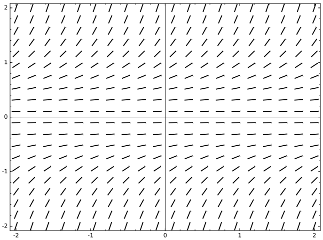
1. Consider the two differential equations (i) $y' = y^2$ and (ii) $y' = x^2$, and the following two slope fields. Which slope fields correspond to which differential equations?

(x)



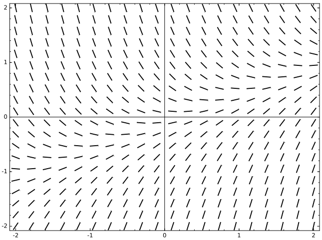
(y)

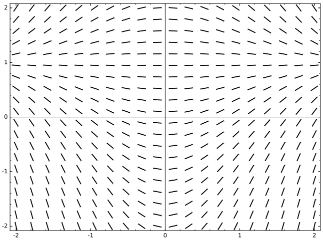


(A) (i) corresponds to (x) and (ii) corresponds to (y).

(B) (i) corresponds to (y) and (ii) corresponds to (x).

2. Consider the two differential equations (i) $y' = x - 2y$ and (ii) $y' = x(1-y)$, and the two following slope fields. Which slope fields correspond to which differential equations?

(x) 

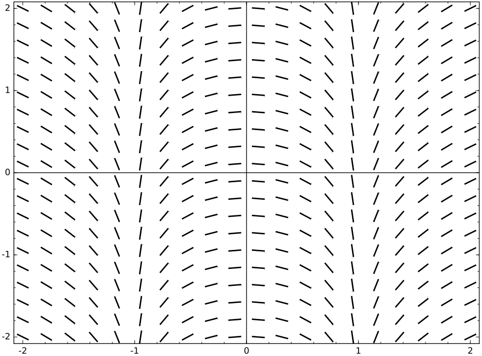
(y) 

(A) (i) corresponds to (x) and (ii) corresponds to (y).

(B) (i) corresponds to (y) and (ii) corresponds to (x).

3. True or False?

The differential equation that has the following slope field has no solution satisfying the initial condition $y(1) = 0$.



4. True or False?

Every solution to the differential equation $y' = x + \sin y$ is increasing for all $x > 1$.

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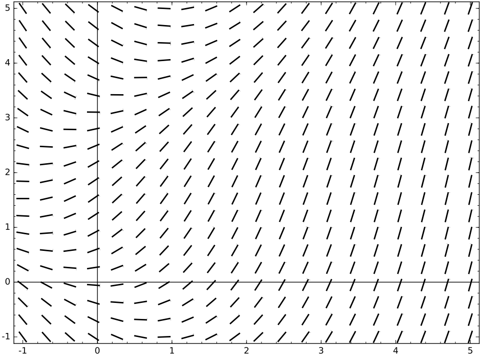


Definition. If $y' = f(x, y)$ is a first order ODE, the set of points (x, y) where $f(x, y) = 0$ is called the *nullcline* of the ODE.

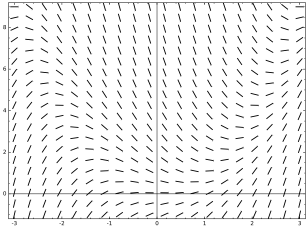
5. What shape is the nullcline of the ODE $y' = x^2 - y$?

(A) Line

(B) Parabola

(C) Hyperbola

(D) None of the above



6. Which of the following ODEs has a nullcline shaped like a hyperbola?

(A) $y' = 1/x$

(B) $y' = 1/y$

(C) $y' = y - 1/x$

(D) None of the above

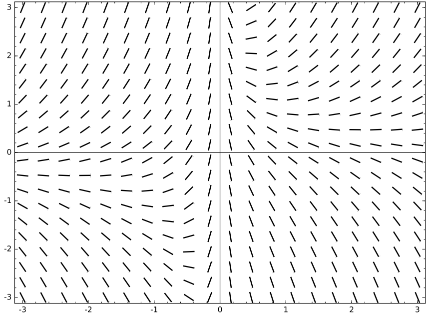
6. Which of the following ODEs has a nullcline shaped like a hyperbola?

(A) $y' = 1/x$

(B) $y' = 1/y$

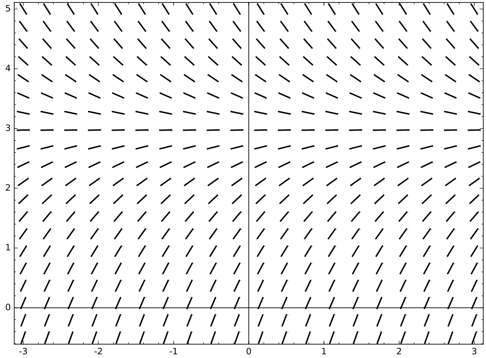
(C) $y' = y - 1/x$

(D) None of the above



7. True or False?

Suppose that the function f is a solution to the differential equation $y' = 3 - y$. Then $\lim_{x \to \infty} f(x) = 3$.



8. True or False?

Consider the initial value problem $y' = y$ and $y(0) = 1$, whose solution is $y = e^x$. If we perform Euler's method with step size 0.1 to approximate $y(1)$, the resulting approximation will underestimate $y(1)$.