The following problems are a combination of AP® Classroom problems, released exam problems from AP® Central, and adapted from Mark Kiraly's card match problems from 7.3.

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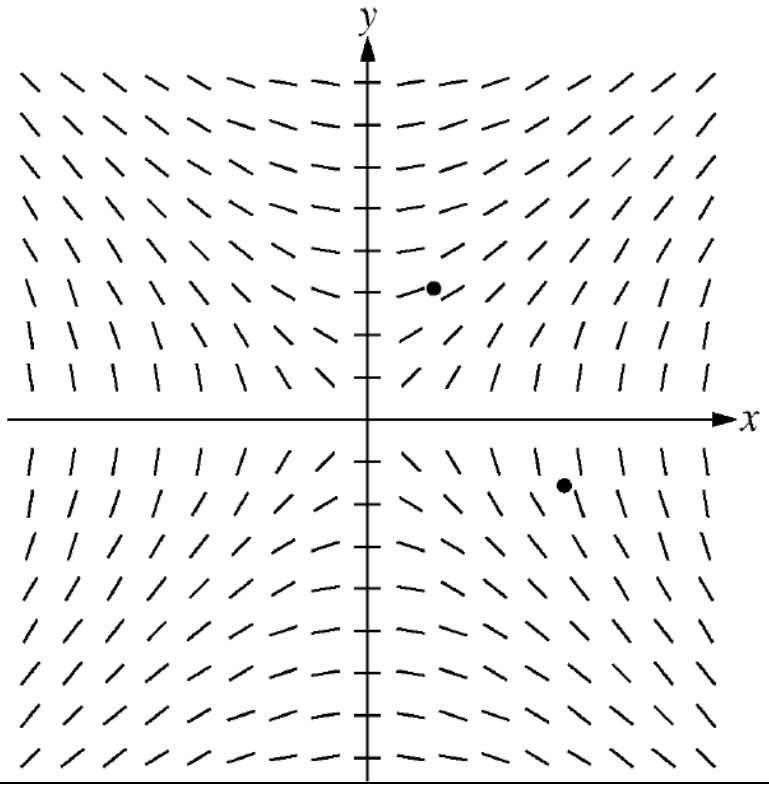
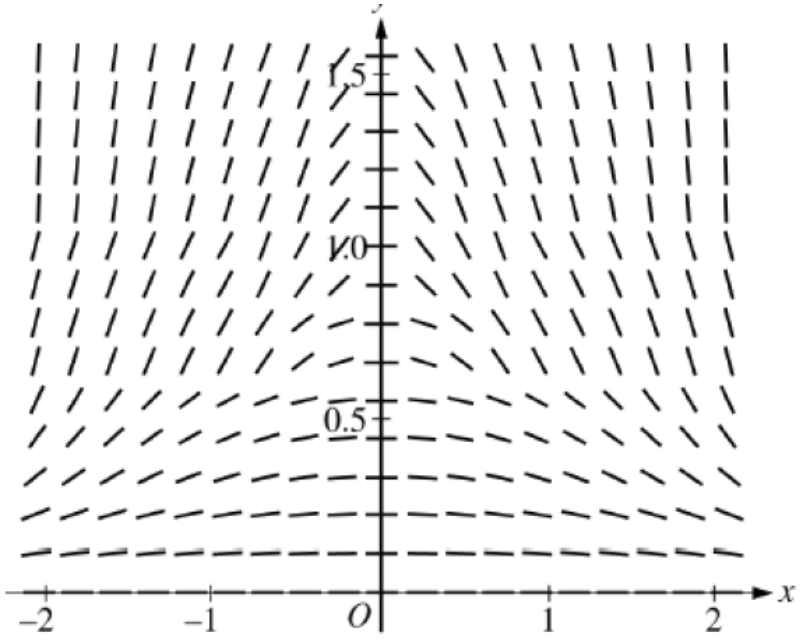
1. The slope field for the given differential equation $\frac{dy}{dx} = \frac{x}{y}$, where, $y \neq 0$, is shown below. Sketch the solution curve that passes through the point (3, -1) and sketch the solution curve that passes through the point (1, 2).



2.

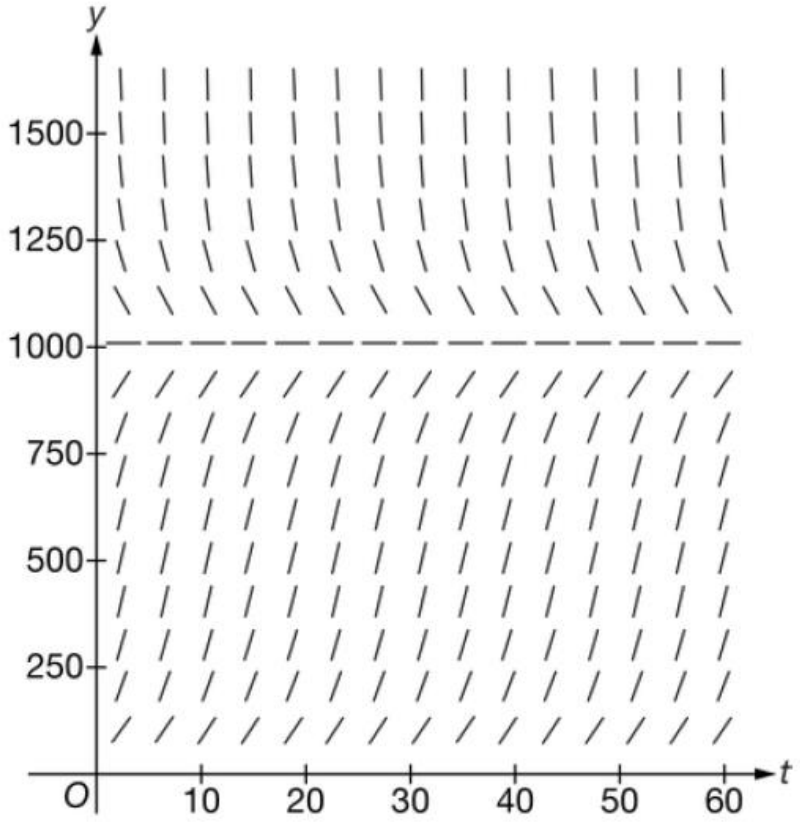


The slope field for a certain differential equation is shown above. Which of the following could be a solution to the differential equation with the initial condition $y(0) = 1$?

(A) $y = \cos x$ (B) $y = 1 - x^2$ (C) $y = e^x$ (D) $y = \sqrt{1 - x^2}$ (E) $y = \frac{1}{1+x^2}$

3. The number of frogs living in a pond at time t, measured in weeks, is modeled by the function $y = F(t)$ that satisfies the differential equation $\frac{dy}{dt} = \frac{1}{2500}y(1010 - y)$. The number of frogs in the pond at time $t = 0$ is $F(0) = b$ where b is a positive constant.

A slope field for the given differential equation is shown in the figure below. Sketch the solution curve that passes through the point (0, 250) and sketch the solution curve that passes through the point (0, 1500).



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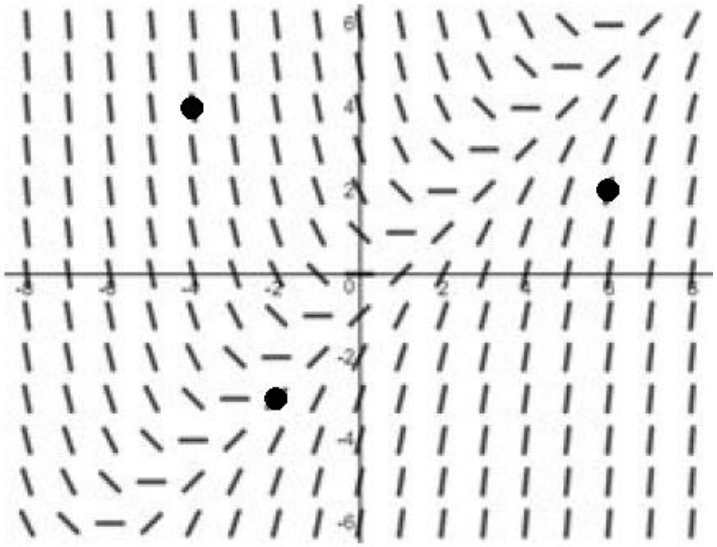
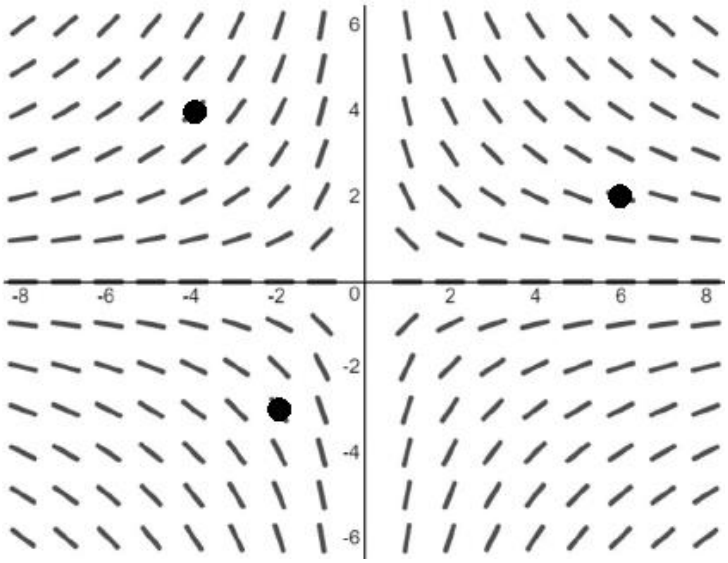
4. For the given differential equation, sketch the solution curve that passes through the point $(-4, 4)$, sketch the solution curve that passes through the point $(6, 2)$, and sketch the solution curve that passes through the point $(-2, -3)$.

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



5-7: For each of the given differential equations, sketch the solution curve that passes through the point $(-4, 4)$, sketch the solution curve that passes through the point $(6, 2)$, and sketch the solution curve that passes through the point $(-2, -3)$.

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



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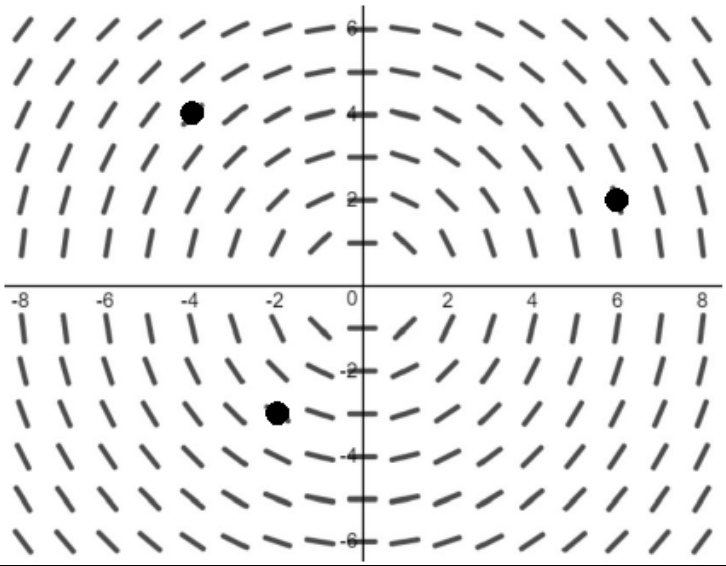
6. $\frac{dy}{dx} = -\frac{x}{y}$



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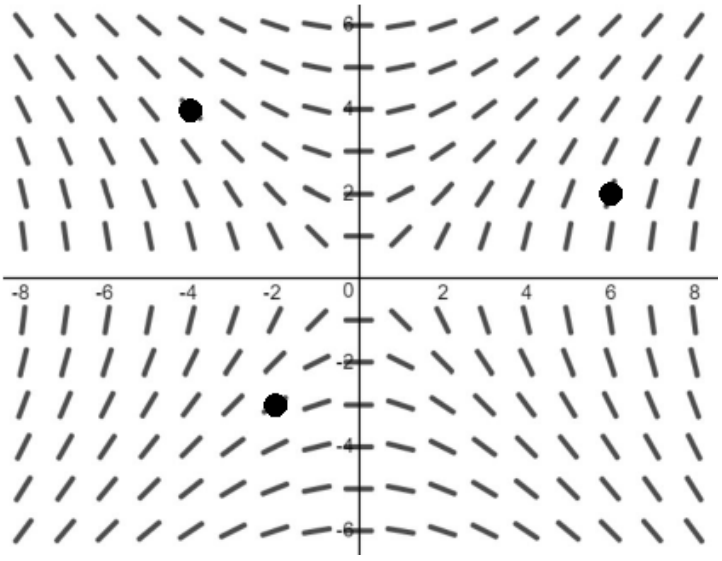
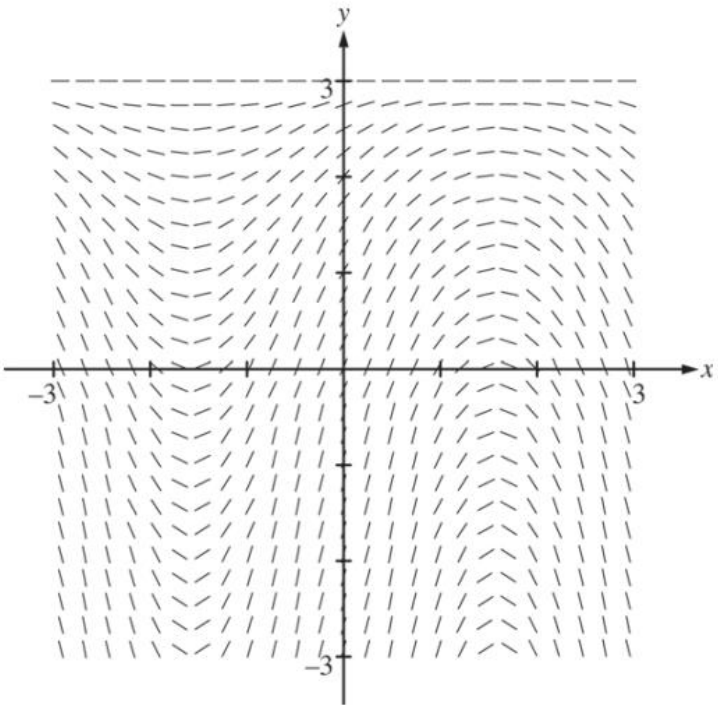
7. $\frac{dy}{dx} = \frac{x}{y}$



2014 AB6 Consider the differential equation $\frac{dy}{dx} = (3 - y)\cos x$. Let $y = f(x)$ be the particular solution to the differential equation with the initial condition $f(0) = 1$. The function f is defined for all real numbers.

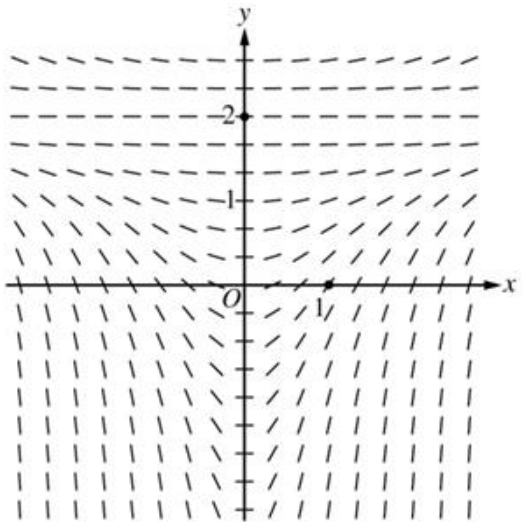
(a) A portion of the slope field of the differential equation is given below. Sketch the solution curve through the point $(0, 1)$.



(b) Write an equation for the line tangent to the solution curve in part (a) at the point $(0, 1)$. Use the equation to approximate $f(0.2)$.

2018 AB 6 Consider the differential equation $\frac{dy}{dx} = \frac{1}{3}x(y - 2)^2$.

(a) A slope field for the given differential equation is shown below. Sketch the solution curve that passes through the point $(0, 2)$, and sketch the solution curve that passes through the point $(1, 0)$.



(b) Let $y = f(x)$ be the particular solution to the given differential equation with initial condition $f(1) = 0$. Write an equation for the line tangent to the graph of $y = f(x)$ at $x = 1$. Use your equation to approximate $f(0.7)$.