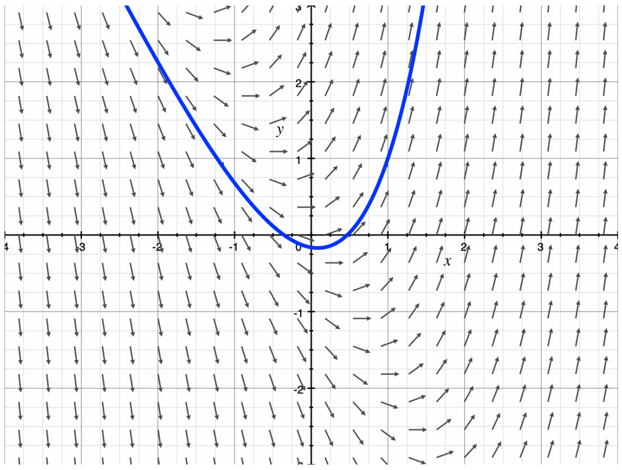
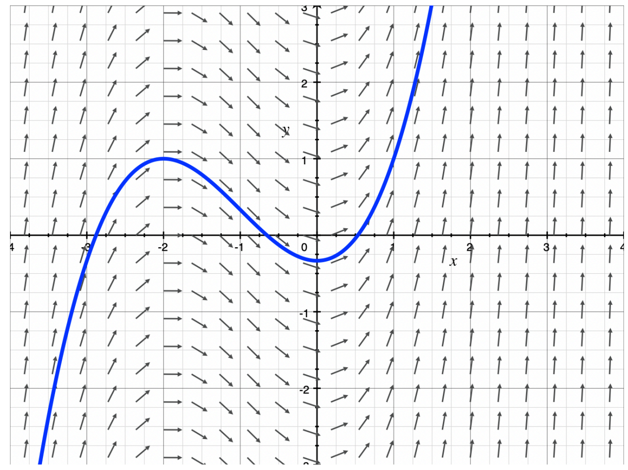
■ 1. Sketch the direction field for $y' = y - 2x$ and the solution curve at $(1,1)$.

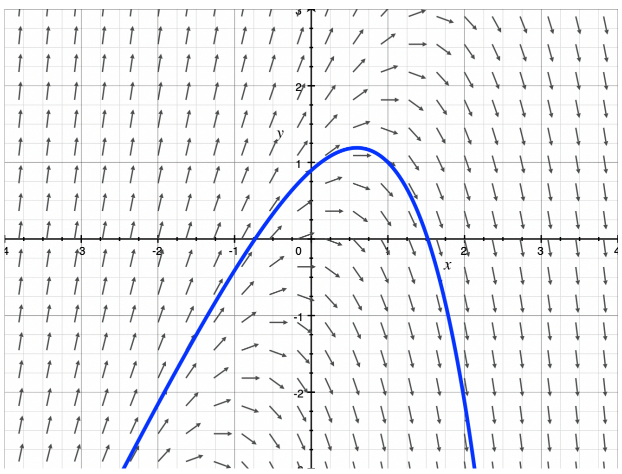
A



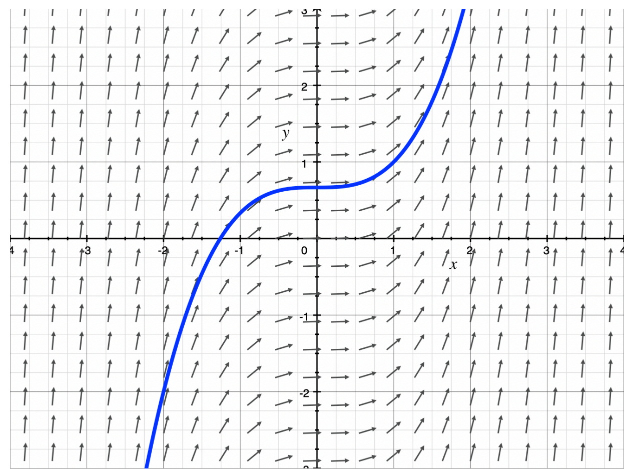
B



C



D



■ 2. Shown below is the slope field for which of the following differential equations?

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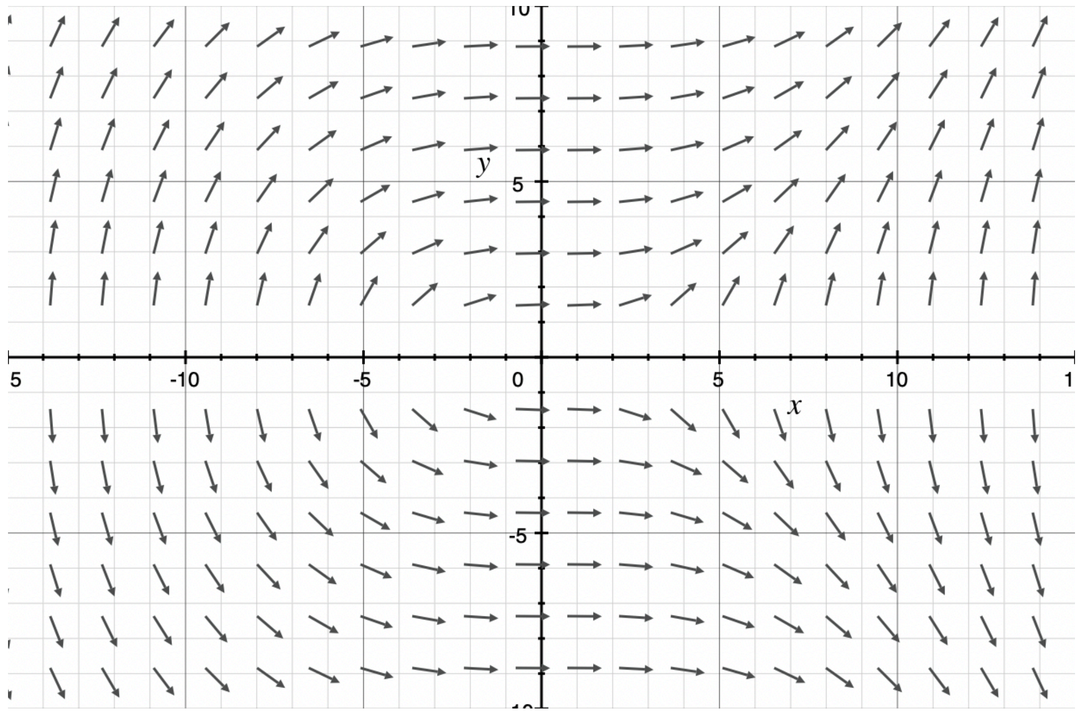

A $\frac{dy}{dx}=\frac{-x^2}{5y}$

B $\frac{dy}{dx}=\frac{x^2}{10y}$

C $\frac{dy}{dx}=\frac{x^3}{10y}$

D $\frac{dy}{dx}=\frac{5}{y}$

■ 3. Find the limit $\lim_{x\to-\infty} f(x)$ from the slope field shown below for $\frac{dy}{dx}=\frac{y^2-16}{8}$ that satisfies the initial condition $f(-2)=2$.

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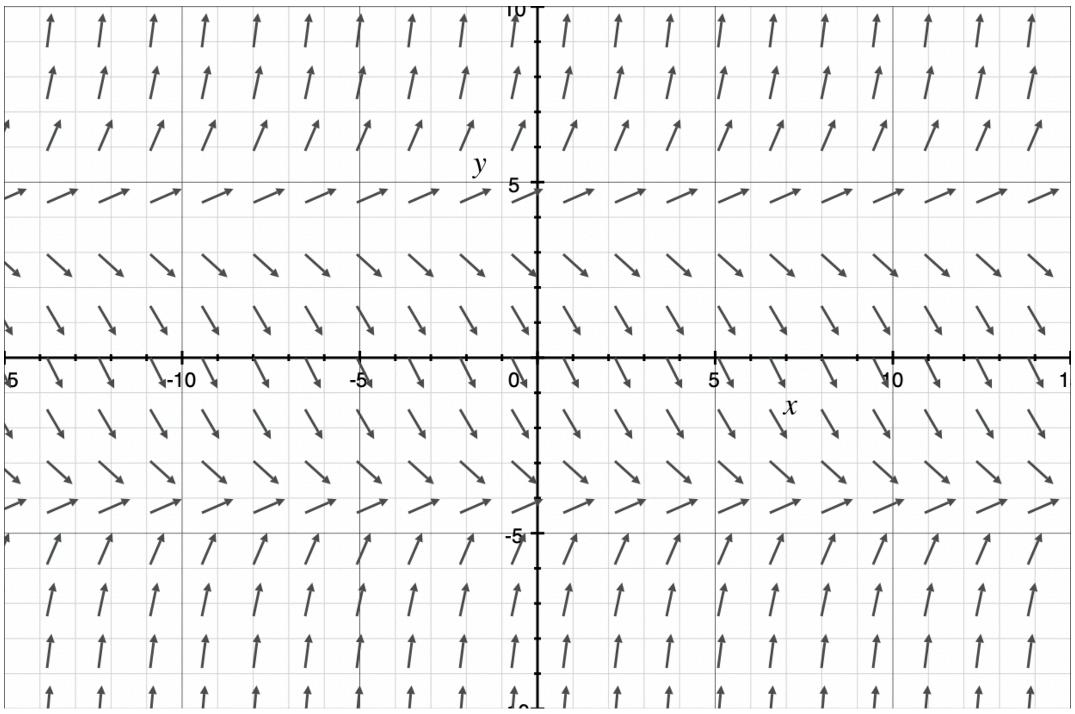

A -4

B 0

C 4

D ∞

■ 4. Which of the following is a solution to the differential equation $4y - xy' = -12$?

A $y = 2x^4 - 3$

B $y = 4x^2 - 3$

C $y = 3x^2 - 4$

D $y = 4x^3 - 12$

■ 5. Given that $y = g(x)$ is a particular solution to the differential equation $\frac{dy}{dx} = (x-2)(y^2-1)$, and the initial condition $f(1) = 2$, which of the following is the equation of the tangent line to $f(x)$ at the point $(1,2)$?

A $y - 2 = 3(x - 1)$

B $y = 2$

C $y - 3 = 2(x - 1)$

D $y - 2 = -3(x - 1)$

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■ 6. Find the solution to the separable differential equation $\frac{du}{dt}=\frac{t^2-2t}{2u}$ when $u(0)=1$.

A $u=\sqrt{t^3-t^2+1}$

B $u=\sqrt{\frac{1}{3}t^3-t^2+1}$

C $u=\sqrt{t^3-t^2+\frac{1}{3}}$

D $u=\sqrt{\frac{1}{3}t^3-t^2+3}$

■ 7. A student solved the differential equation $\frac{dy}{dx}=y\sin x$ with the initial condition that $y=2$ when $x=\pi$. In which step did he make his first error?

Step 1: $\int y\ dy=\int \sin x\ dx$

Step 2: $\frac{1}{2}y^2=\cos y+C$

Step 3: Since $y(\pi)=2$, $C=3$

Step 4: $\frac{1}{2}y^2=\cos y+3$

Step 5: $y=\sqrt{2\cos y+6}$

A Step 1

B Step 2

C Step 3

D Step 4

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■ 8. Which of the following is the generic solution to the differential equation $\frac{dy}{dx} = 2y^2$?

A $y = -2x + C$

B $y = -\frac{1}{2x} + C$

C $y = \sqrt[3]{6x + C}$

D $y = -\frac{1}{2x + C}$

■ 9. The rate of change of a population of rabbits, $\frac{dR}{dt}$, is directly proportional to the population, R. If t is in terms of months, if there were initially 20 rabbits, and if there were 75 rabbits after 5 months, which equation represents the population of rabbits over time, $R(t)$?

A $R(t) = 2e^{11t}$

B $R(t) = 11t + 20$

C $R(t) = 20e^{0.2644t}$

D $R(t) = e^{0.8051t} + 19$

■ 10. Given the differential equation $\frac{dy}{dx} = y(x^2 - 1)$,

a. Sketch a slope field.

b. Find an expression for $\frac{d^2y}{dx^2}$ in terms of x and y.

c. Find the particular solution $y = f(x)$ that satisfies $f(3) = 2$.

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■ 11. Given the differential equation $\frac{dy}{dx} = x + 2y$,

a. Describe the region in the xy-plane where the slope field has positive slopes.

b. Given that $y = h(x)$ is a solution to this differential equation satisfying $h(3) = -2$, find the equation for the tangent line to $h(x)$ at the point $(-2,3)$, then use the tangent line to approximate $h(-2.1)$.

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