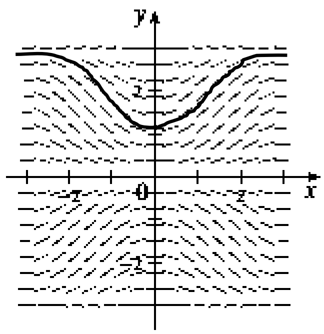
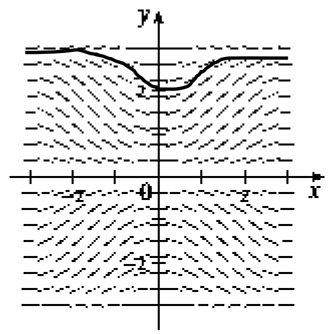
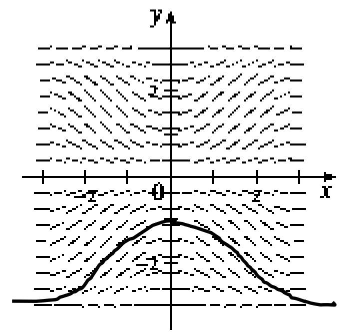
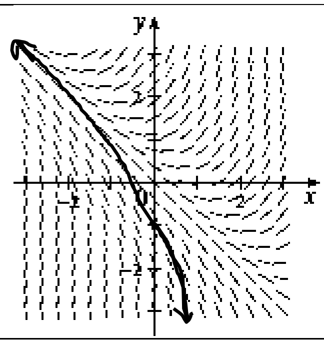
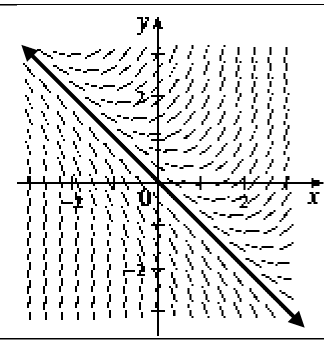
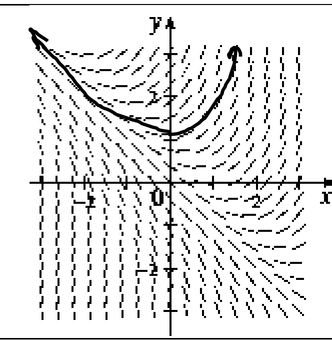
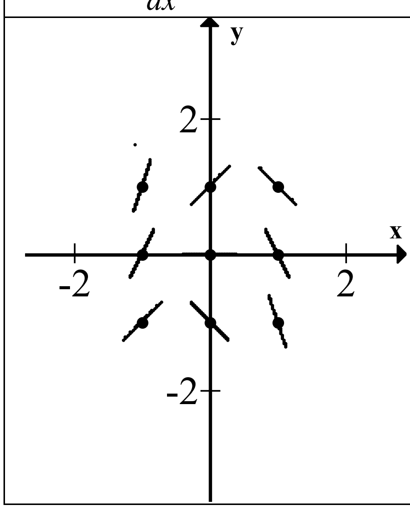
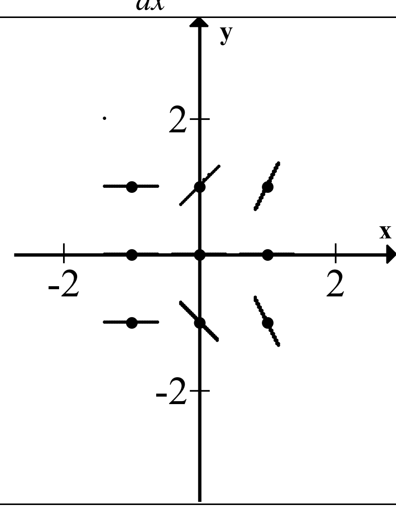
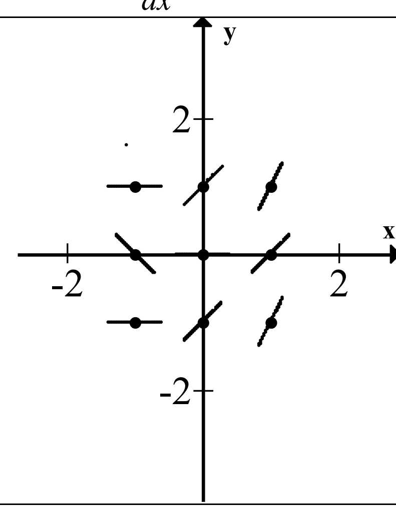
Use the slope field below to sketch graphs of the solutions that satisfy the given initial conditions

$y(0)=1$	$y(0)=2$	$y(0)=-1$
		

Use the slope field below to sketch graphs of the solutions that satisfy the given initial conditions

$y(0)=-1$	$y(0)=0$	$y(0)=1$
		

Sketch the given slope field at the indicated points.

$\frac{dy}{dx}=y-2x$	$\frac{dy}{dx}=y+xy$	$\frac{dy}{dx}=x+y^2$
		

College Board scores the above on the following criteria:

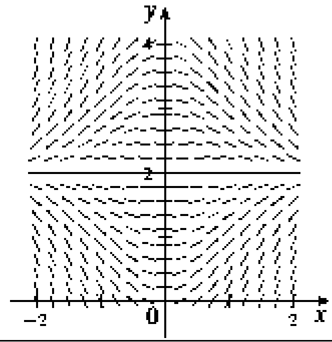
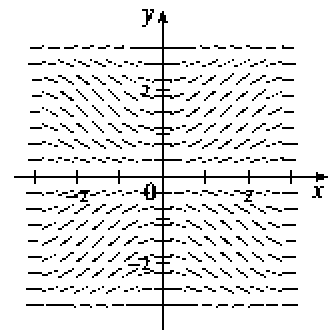
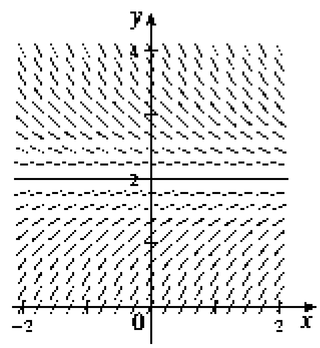
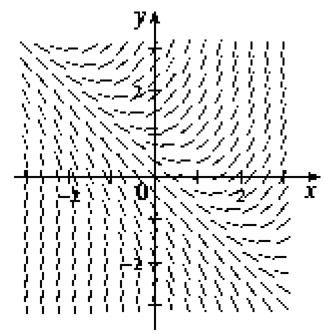
Slopes are drawn with positive slope when $\frac{dy}{dx}>0$, negative when $\frac{dy}{dx}<0$, and horizontal when $\frac{dy}{dx}=0$. Relative steepness must be consistent in rows (horizontally) and in columns (vertically).

Match the given differential equation with its slope field.

<table>
<tr>
<td rowspan="2">$\frac{dy}{dx} = 2 - y$ (C)

$\frac{dy}{dx} = x(2 - y)$ (A)

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

$\frac{dy}{dx} = \sin(x)\sin(y)$ (E)</td>
<td>(A)
</td>
<td>(B)
</td>
</tr>
<tr>
<td>(C)
</td>
<td>(D)
</td>
</tr>
</table>

How to eliminate answer choices for each differential equation:

$\frac{dy}{dx} = 2 - y$: The differential equation depends only on the *y*-values. Therefore, the slope segments of the slope field must be the same at each horizontal line. There is only one answer choice that fits this visual cue, which is answer choice (C).

$\frac{dy}{dx} = x(2 - y)$: This differential equation will have slope zero when $x = 0$ and $y = 2$. Therefore, the slope field must have horizontal slope segments along the lines $x = 0$ and $y = 2$. The only slope field that fits this visual cue is (A)

$\frac{dy}{dx} = x + y - 1$: when $y = -x$, the slope will be constantly -1. The slope field where the slope segments have a slope of -1 along the line $y = -x$ is (D).

By process of elimination, the slope field for $\frac{dy}{dx} = \sin(x)\sin(y)$ is (E). For this differential equation, the slopes are zero when $x = 0$ and $y = 0$. The slope field that has horizontal segments along the *x* and *y*-axes is (E).

Use Euler's Method with step size 0.1 to estimate $y(0.2)$, where $y(x)$ is the solution of the initial value problem $\frac{dy}{dx} = y + xy$ where $y(0) = 1$.

$$(0,1) \to \left(0 + \text{step size}\ ,\ y(0) + \left[\frac{dy}{dx}\ \text{at}\ (0,1)\right] \cdot (\text{step size})\right)$$
$$\approx \left(0.1, 1 + [1 + 0 \cdot 1] \cdot 0.1\right)$$
$$\approx (0.1, 1.1)$$
$$\swarrow$$
$$(0.1,1.1) \to \left(0.1 + \text{step size}\ ,\ y(0.1) + \left[\frac{dy}{dx}\ \text{at}\ (0.1,1.1)\right] \cdot (\text{step size})\right)$$
$$\approx \left(0.1 + 0.1, 1.1 + [1.1 + (0.1)(1.1)] \cdot 0.1\right)$$
$$\approx \left(0.2, 1.1 + [1.1 + (0.1)(1.1)] \cdot 0.1\right)$$
$$\approx (0.2, 1.221)$$

Use Euler's Method with step size 0.2 to estimate $y(0.4)$ where $y(x)$ is the solution of the initial-value problem $\frac{dy}{dx} = xy - x^2$ where $y(0) = 1$.

$$
\begin{aligned}
(0,1) \rightarrow & \left(x(0) + \text{step size} \ , \ y(0) + \left[\frac{dy}{dx} \text{ at } (0,1) \right] \cdot (\text{step size}) \right) \\
& \approx \left(0 + 0.2, 1 + \left[(0)(2) - (0)^2 \right] \cdot 0.2 \right) \\
& \approx (0.2, 1) \\
& \swarrow \\
(0.2,1) \rightarrow & \left(0.2 + \text{step size} \ , \ y(0.2) + \left[\frac{dy}{dx} \text{ at } (0.2,1) \right] \cdot (\text{step size}) \right) \\
& \approx \left(0.2 + 0.2, 1 + \left[(0.2)(1) - (0.2)^2 \right] \cdot 0.2 \right) \\
& \approx (0.4, 1.032)
\end{aligned}
$$

$y(0.4) \approx 1.032$