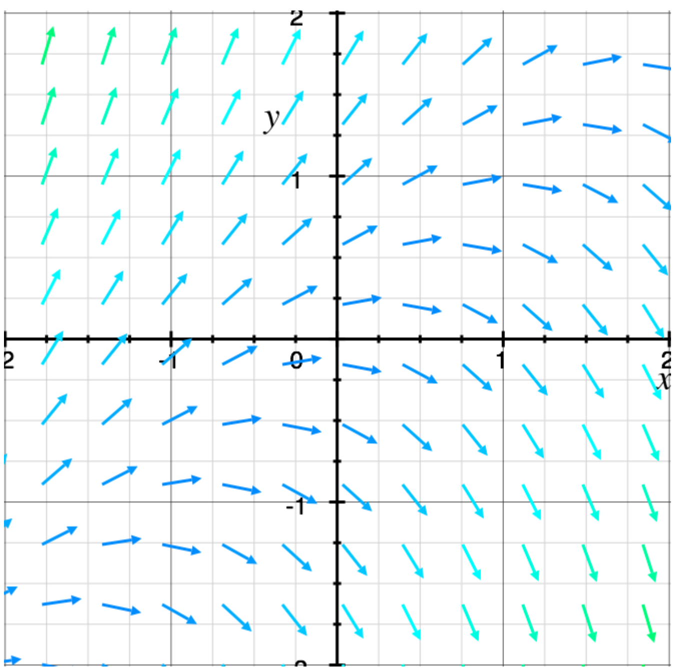
Topic: Sketching direction fields

Question: Sketch the direction field.

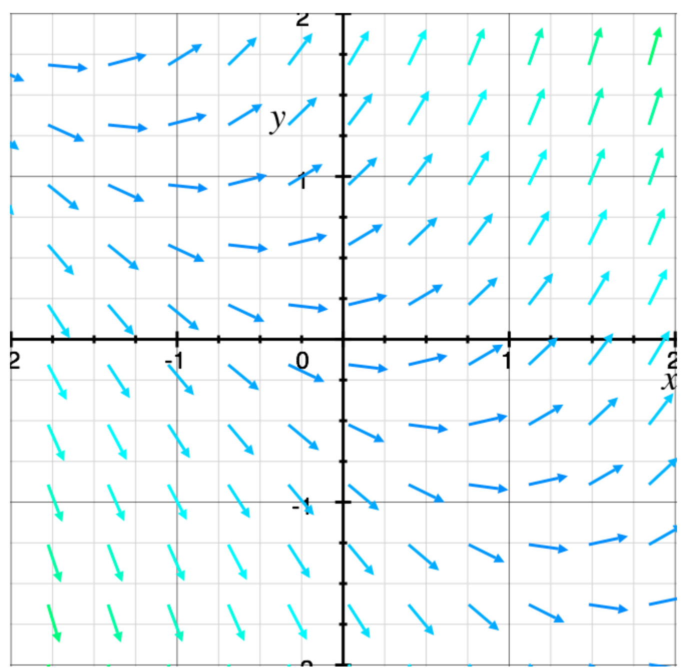
$$y' = y + x$$

Answer choices:

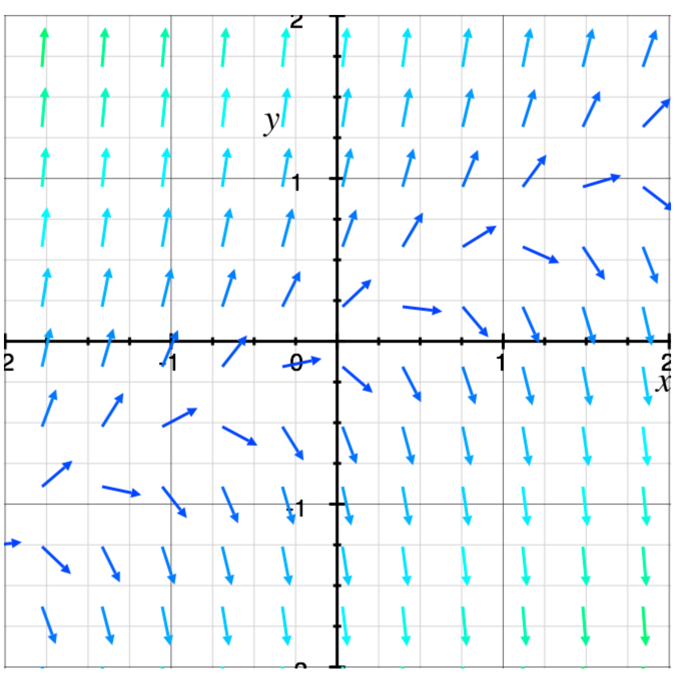
A



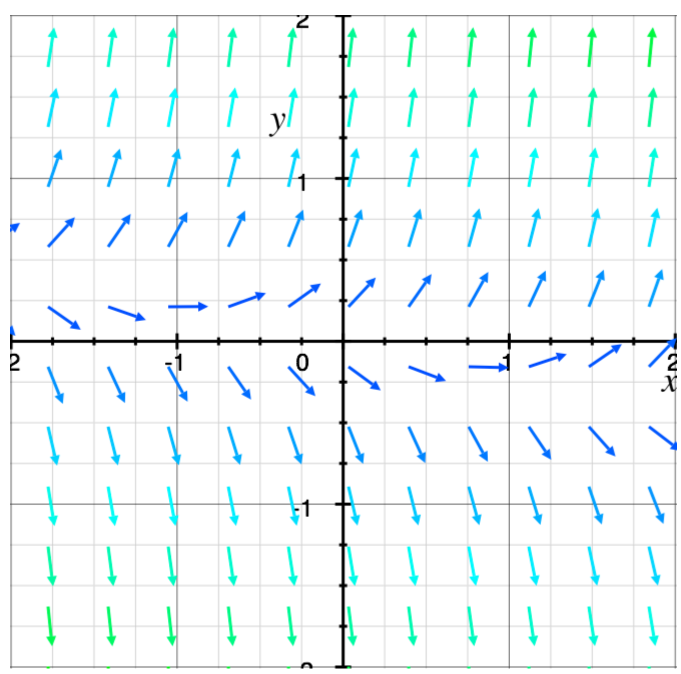
B



C



D



Solution: B

Before you try to sketch the direction field, you want to make sure your equation is solved for y'.

$$y' = y + x$$

We'll need to make several tables, and our strategy will be to keep x constant in each table. So our first table will be for $x = -2$. We'll explore y-values on the interval $[-2,2]$, and then pairing those x and y values together, we'll solve for values of y'.

The table for $x = -2$ is

y'	-4	-3	-2	-1	0
x	-2	-2	-2	-2	-2
y	-2	-1	0	1	2

The table for $x = -1$ is

y'	-3	-2	-1	0	1
x	-1	-1	-1	-1	-1
y	-2	-1	0	1	2

The table for $x = 0$ is

y'	-2	-1	0	1	2
x	0	0	0	0	0
y	-2	-1	0	1	2

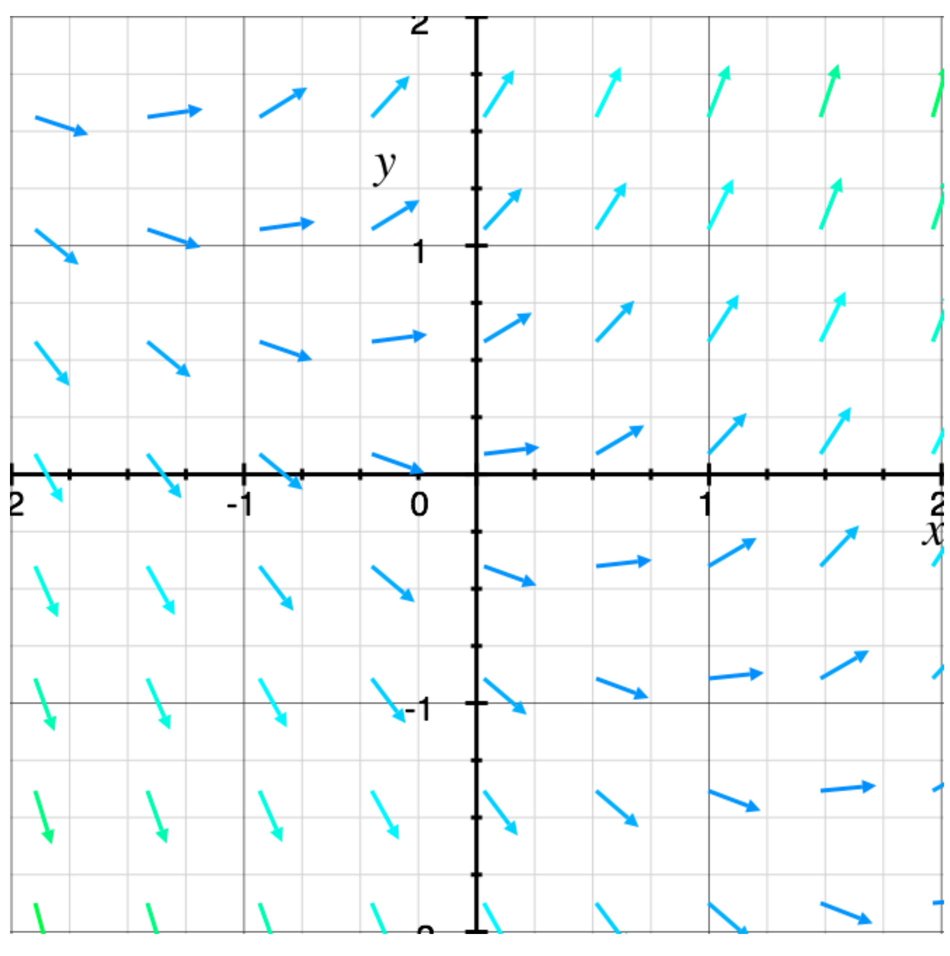
The table for $x = 1$ is

y'	-1	0	1	2	3
x	1	1	1	1	1
y	-2	-1	0	1	2

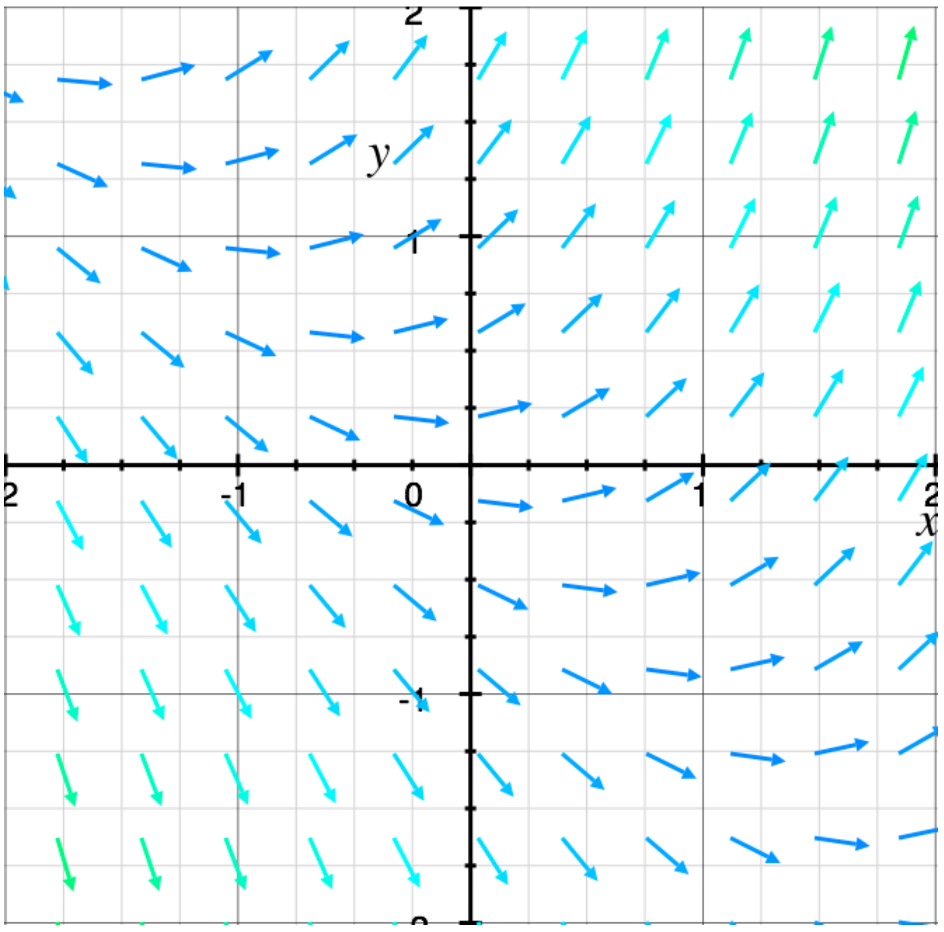
The table for $x = 2$ is

y'	0	1	2	3	4
x	2	2	2	2	2
y	-2	-1	0	1	2

The values of y' that we found represent the slope of the function at the corresponding point (x, y). For example, in this last table, we see the point $(2, -2)$, and the corresponding value of $y' = 0$. This means that the slope of the function at $(2, -2)$ is 0, so we'd draw a small, short horizontal line right at $(2, -2)$. Plotting all of the other point-slope pairs, the direction field starts to look something like this:



If we add more points, maybe ones that are half-way between those that we already found, a more complete direction field should look something like this:



2
y
1
2
-1
0
1
2
x
-1

Topic: Sketching direction fields

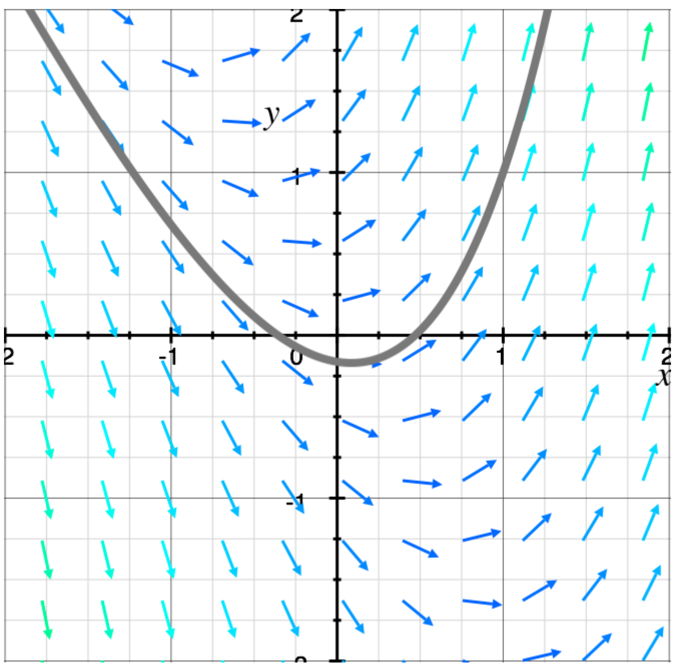
Question: Sketch the direction field and the solution curve at the given point.

$$y' = y - 2x$$

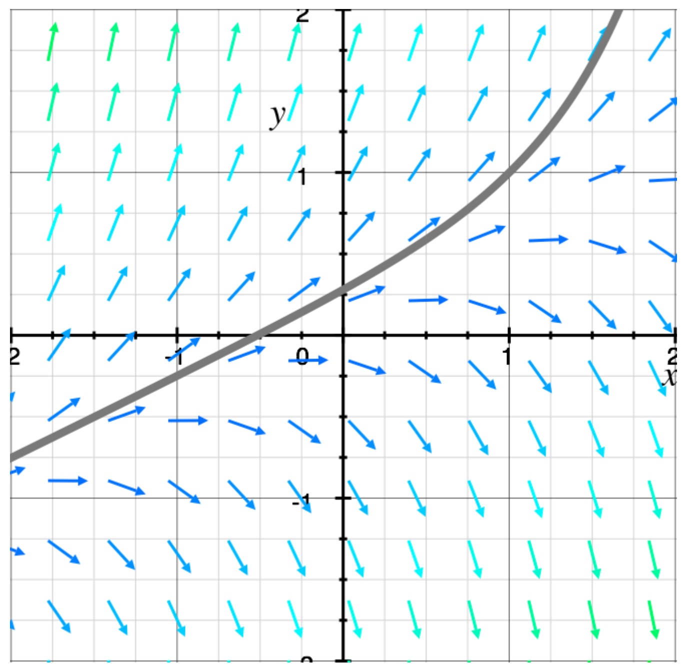
at $(1,1)$

Answer choices:

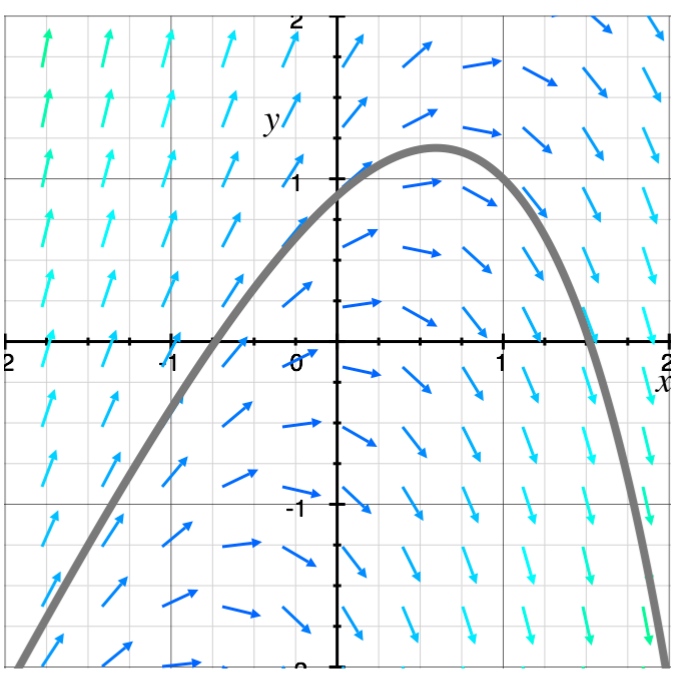
A



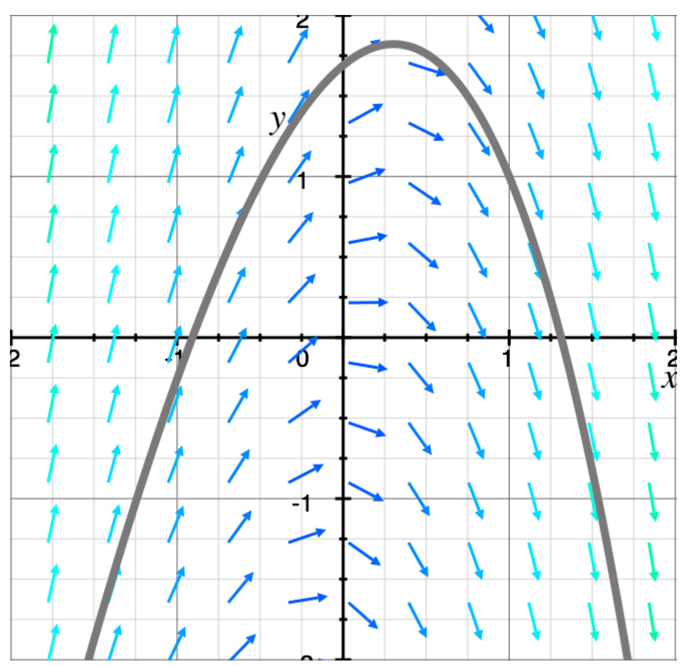
B



C



D



Solution: C

Before you try to sketch the direction field, you want to make sure your equation is solved for y'.

$$y' = y - 2x$$

We'll need to make several tables, and our strategy will be to keep x constant in each table. So our first table will be for $x = -2$. We'll explore y-values on the interval $[-2,2]$, and then pairing those x and y values together, we'll solve for values of y'.

The table for $x = -2$ is

y'	2	3	4	5	6
x	−2	−2	−2	−2	−2
y	−2	−1	0	1	2

The table for $x = -1$ is

y'	0	1	2	3	4
x	−1	−1	−1	−1	−1
y	−2	−1	0	1	2

The table for $x = 0$ is

y'	−2	−1	0	1	2
x	0	0	0	0	0
y	−2	−1	0	1	2

The table for $x = 1$ is

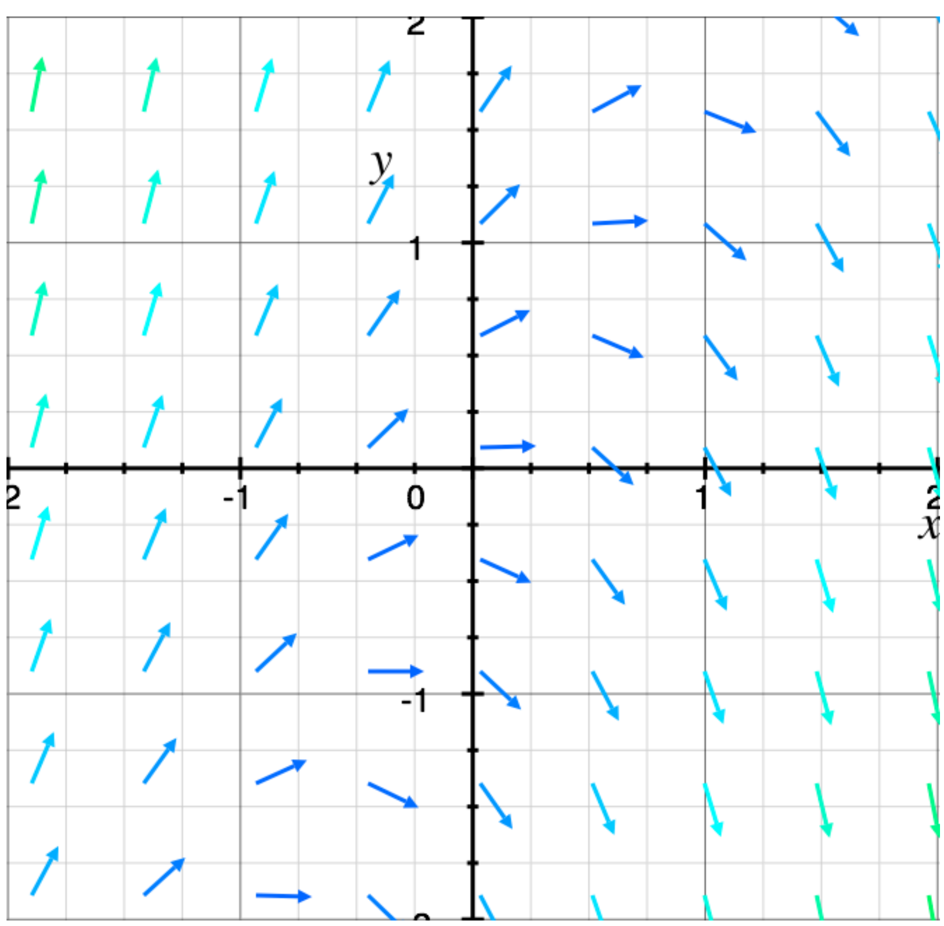
y'	−4	−3	−2	−1	0
x	1	1	1	1	1

y	-2	-1	0	1	2

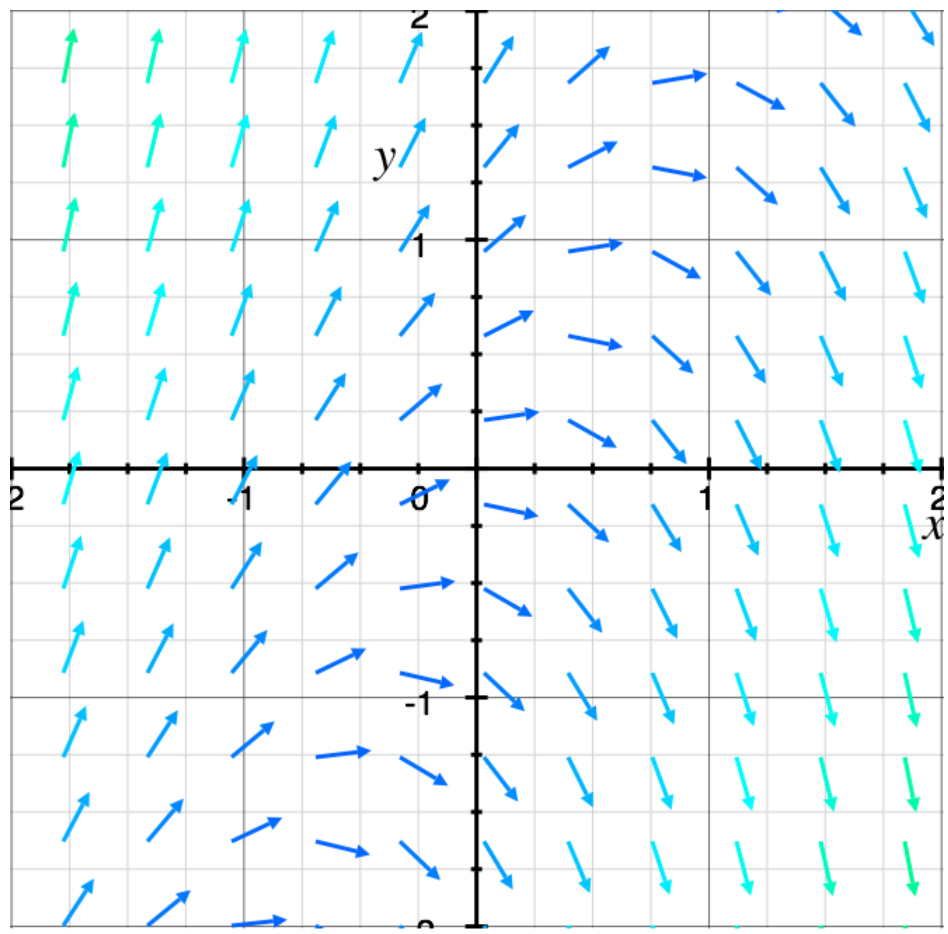
The table for $x = 2$ is

y'	-6	-5	-4	-3	-2
x	2	2	2	2	2
y	-2	-1	0	1	2

The values of y' that we found represent the slope of the function at the corresponding point (x, y). For example, in this last table, we see the point $(2, -2)$, and the corresponding value of $y' = 6$. This means that the slope of the function at $(2, -2)$ is 6, so we'd draw a small, short line with slope 6 right at $(2, -2)$. Plotting all of the other point-slope pairs, the direction field starts to look something like this:



If we add more points, maybe ones that are half-way between those that we already found, a more complete direction field should look something like this:



Sketching the solution curve through $(1,1)$ gives