<u>Answer: Figure 1</u>

dy/dx = -xy

Given that dy/dx = -xy, when x or y is 0 dy/dx = 0. Continuing, when either x or y is negative, but not both, the slopes should be positive, and when x and y are positive or negative the slopes are negative.

<u>Answer: Figure 2</u>

dy/dx = 2x+y

No explanation needed since it is the last figure left.

<u>Answer: Figure 3</u>

dy/dx = x^2/y

Given that dy/dx = x^2/y we know when y=0 for any value of x the slope at those points are undefined. Similarly we know when x=0 for any value of x the slope at those points are zero. Continuing, since x is square for any value of x, x^2 is positive. Therefore when y is negative slope is negative and vice versa for when y is positive.

Answer: Figure 4

$dy/dx = \ln(x)$

$\ln(x)>0$, so the explanation is evident .

Answer: Figure 5

$dy/dx = y/x$

Similar to the explanation for Figure 1 and 3, given that $dy/dx = y/x$, when $x=0$ for any value of y, the slope at those points are undefined; and when $y=0$ for any value of x, the slope at those points are zero. Continuing, when x or y, but not both, are negative slope is negative, and when x and y are positive or negative slope is positive.

Answer: Figure 6

$dy/dx = x^2+y^2$

Given that $dy/dx = x^2+y^2$, we know the only point that has a zero slope is at (0,0), but this implies the answer could also be figure 2. Therefore is is important to note another distinction. For example, since we are squaring both x and y, and using addition, all points should have a positive slope.

2) $\begin{cases} y' = x^2 + y \\ y(0) = -2 \end{cases}$; $h = .25$; approx. $y(1.25)$ $\begin{cases} y' = \frac{dy}{dx} = f(x,y) \\ y(x_0) = y_0 \end{cases}$; $y_{n+1} = y_n + h \cdot f(x_n, y_n)$

for $n = 0,1,2, \ldots$

n	x_n	y_n
0	0	-2
1	.25	-2.5
2	.5	-3.109375
3	.75	-3.8242..
4	1	-4.6396..
5	1.25	-5.54956..

- $y_{n+1} = y_{0+1} = y_1 = y_0 + (.25) f(x_0, y_0) \leftrightarrow y_1 = -2 + (.25)(-2) = -2.5$
- $y_2 = -2.5 + (.25)(.25^2 + [-2.5]) \approx -3.109375$
- $y_3 = -3.109375 + (.25)(.5^2 + [-3.109375]) \approx -3.82421875$
- $y_4 = -3.824\ldots + (.25)(.75^2 + [-3.824\ldots]) \approx -4.6396484375$
- $y_5 = -4.6396\ldots + (.25)(1^2 + [-4.6396\ldots]) \approx -5.549560546875$

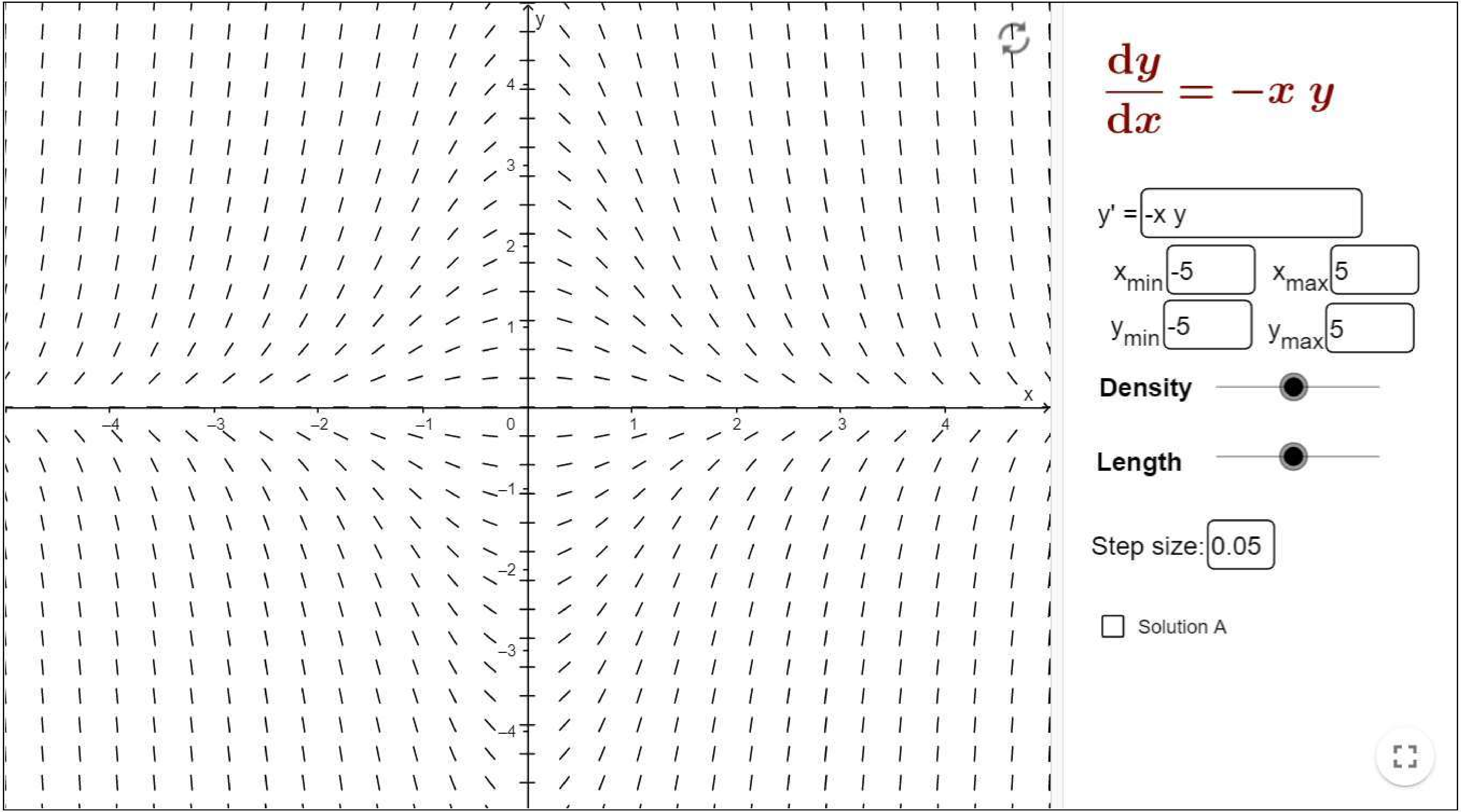
$\boxed{\therefore y(x_5) = y_5 \leftrightarrow y(1.25) \approx -5.54956}$

3) $\begin{cases} y' = y - x \\ y(0) = 3 \end{cases}$; $n = 5$; $0 \le x \le 1$ ① find $h \rightarrow h = \frac{1-0}{5} = \frac{1}{5} = .2$

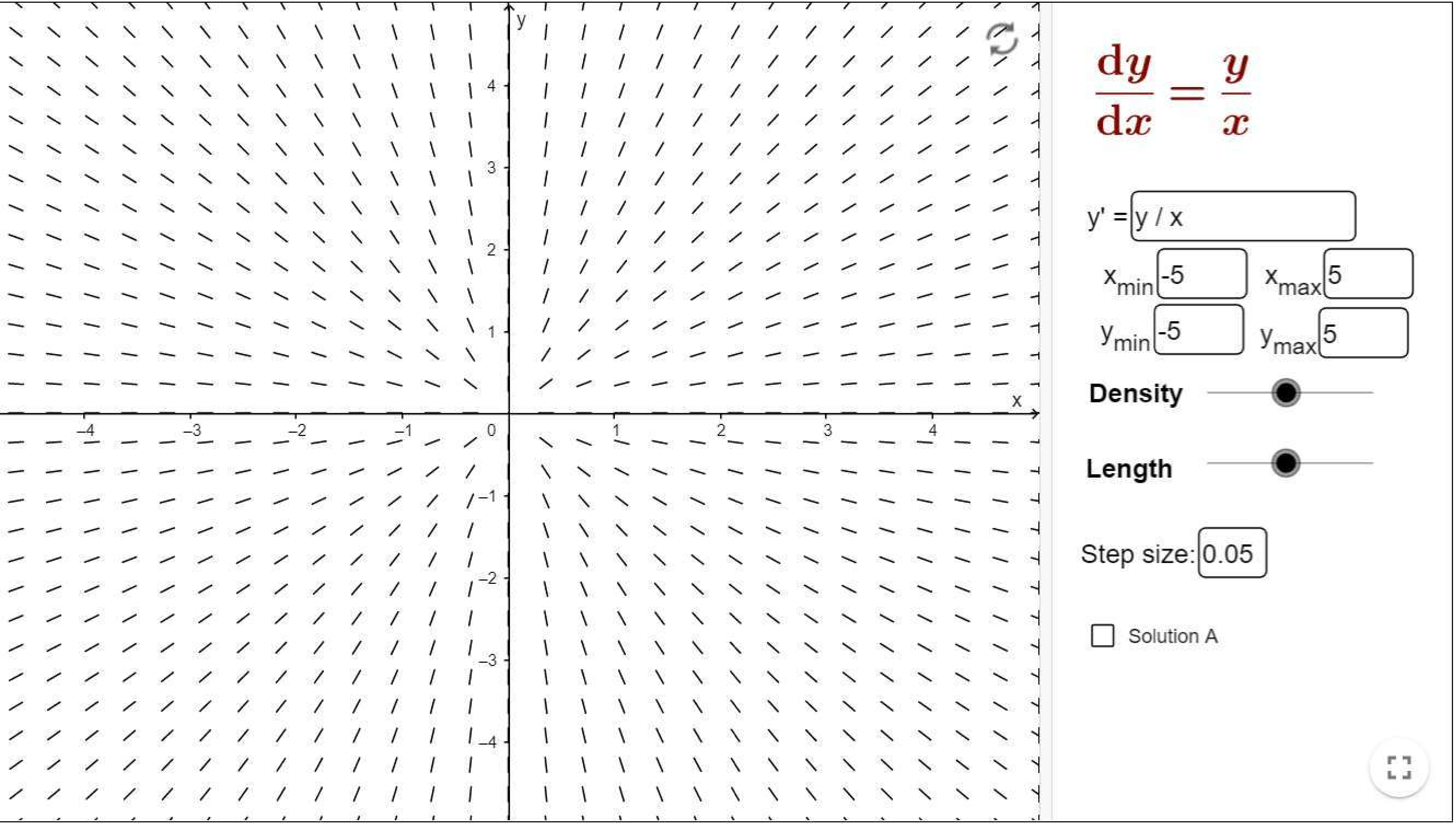
n	x_n	y_n
0	0	3
1	.2	3.6
2	.4	4.28
3	.6	5.056
4	.8	5.9472
5	1	6.97664

- $y_1 = 3 + (.2)(3 - 0) = 3.6$
- $y_2 = 3.6 + (.2)(3.6 - .2) = 4.28$
- $y_3 = 4.28 + (.2)(4.28 - .4) = 5.056$
- $y_4 = 5.056 + (.2)(5.056 - .6) = 5.9472$
- $y_5 = 5.9472 + (.2)(5.9472 - .8) = 6.97664$

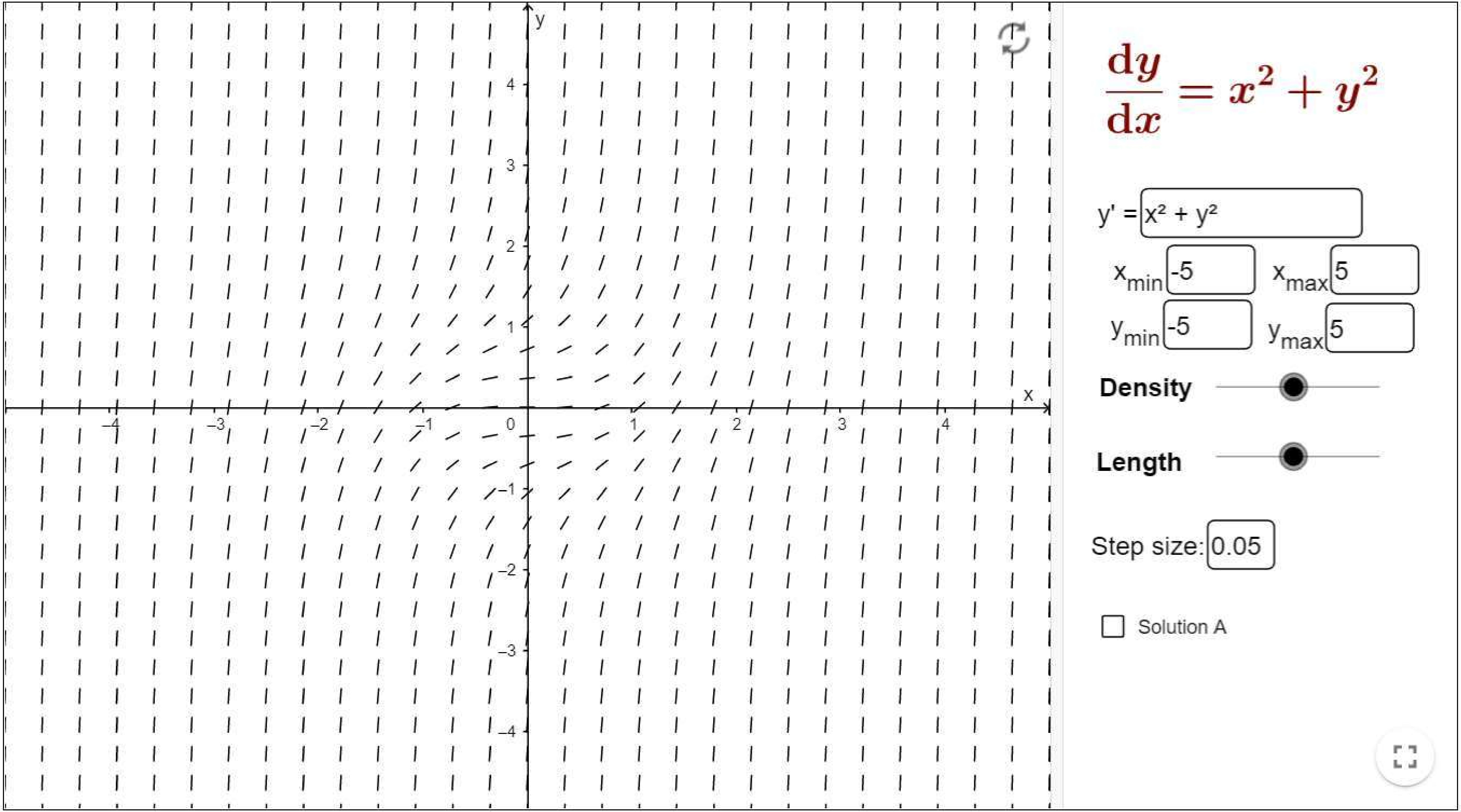
$\boxed{\therefore y(x_5) = y_5 \leftrightarrow y(1) = 6.97664}$



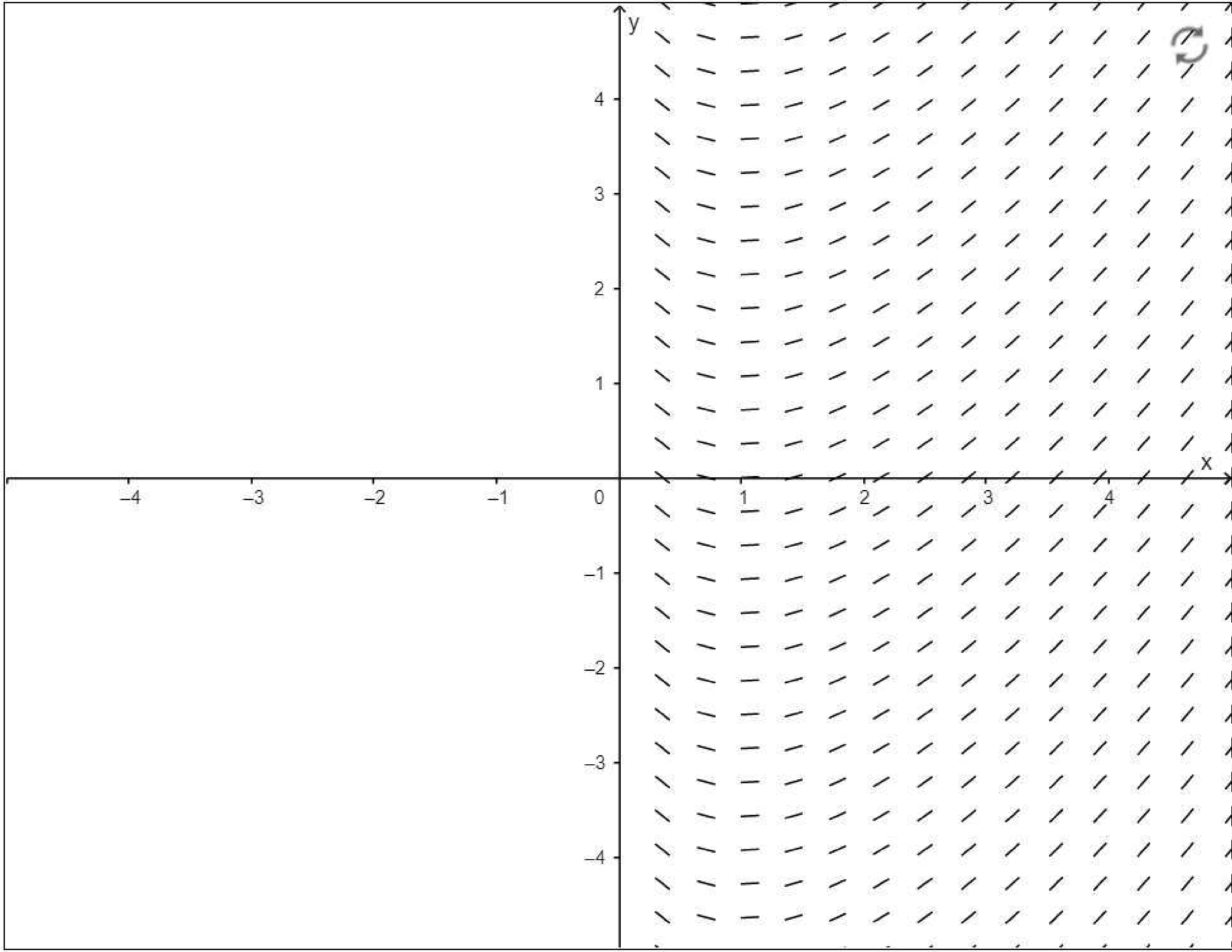
y
x
4
3
2
1
0
-1
-2
-3
-4
$\frac{dy}{dx} = -x\,y$
y' = -x y
x_{min} -5
x_{max} 5
y_{min} -5
y_{max} 5
Density
Length
Step size: 0.05
Solution A



y
x
4
3
2
1
0
−1
−2
−3
−4
$$\frac{dy}{dx} = \frac{y}{x}$$
y' = y / x
x_{min} -5
x_{max} 5
y_{min} -5
y_{max} 5
Density
Length
Step size: 0.05
Solution A



y
x
4
3
2
1
0
−1
−2
−3
−4
$\frac{dy}{dx} = x^2 + y^2$
y' = x² + y²
xmin -5
xmax 5
ymin -5
ymax 5
Density
Length
Step size: 0.05
Solution A



$$\frac{dy}{dx} = \ln(x)$$

y' = ln(x)

x_{min} -5 x_{max} 5

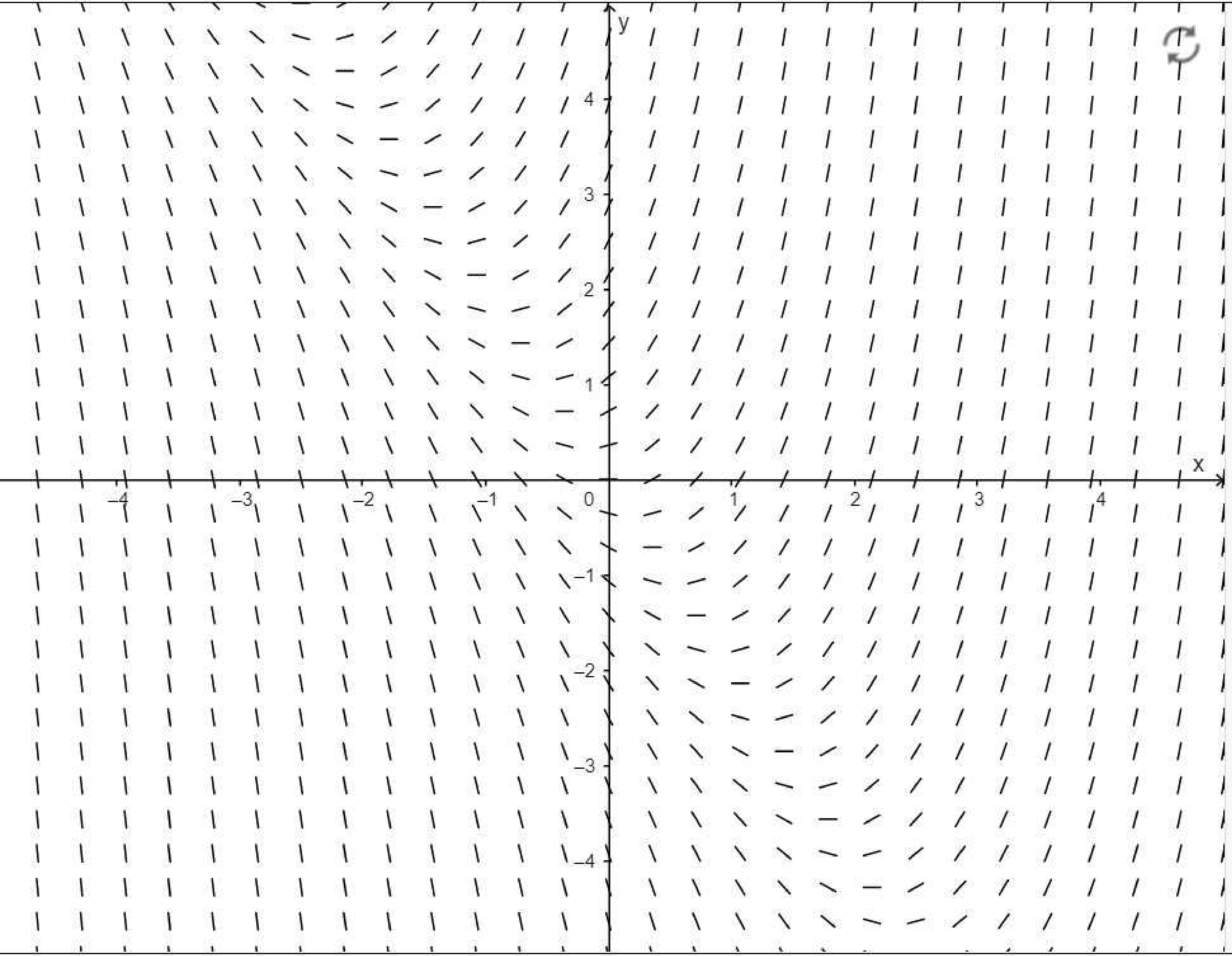
y_{min} -5 y_{max} 5

Density

Length

Step size: 0.05

☐ Solution A



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

y' = 2x + y

x_{min} -5 x_{max} 5

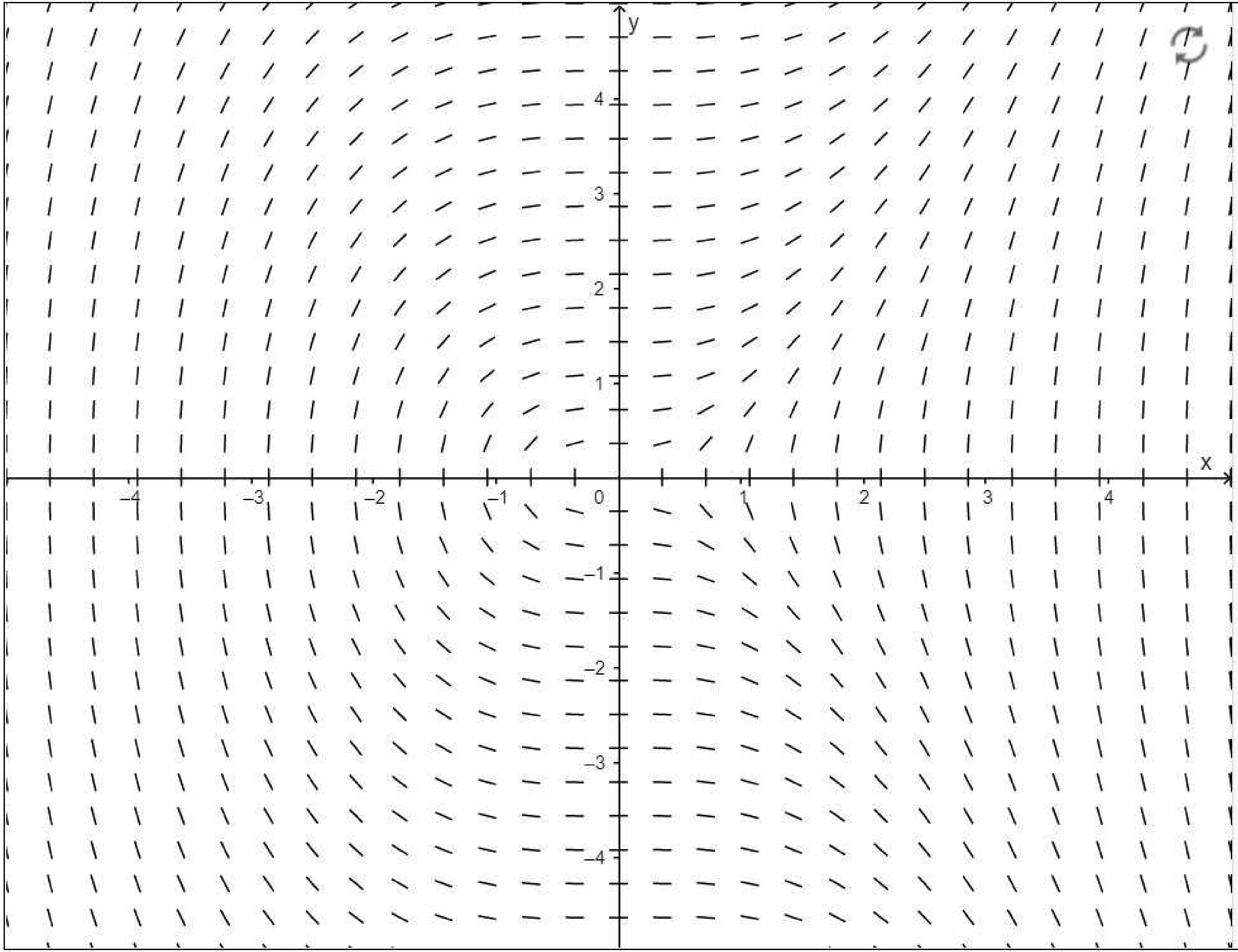
y_{min} -5 y_{max} 5

Density

Length

Step size: 0.05

☐ Solution A



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

y' = x² / y

x_{min} -5 x_{max} 5

y_{min} -5 y_{max} 5

Density

Length

Step size: 0.05

☐ Solution A