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

$$\frac{dy}{dx} = xy$$

x	0	1	2	3
y	0	1	2	3
$\frac{dy}{dx}$	0	1	4	9

(2) $\left.\begin{array}{l} \dfrac{\delta M}{\delta y} = \dfrac{\delta M}{\delta x} \\ \\ \text{equation: } M(x,y)\,dx + N(x,y)\,dy = 0 \end{array}\right\}$ condition

now,

$$(2y\sin x\cos x - y + 2y^2 e^{xy^2})\,dx - (x - \sin^2 x - 4xye^{xy^2})\,dy = 0$$

$$M(x,y) = 2y\sin x\cos x - y + 2y^2 e^{xy^2}$$

$$N(x,y) = -(x - \sin^2 x - 4xye^{xy^2})$$

$$\therefore \frac{\delta M}{\delta y} = 2\sin x\cos x - 1 + 2(y^2 e^{xy^2} x\,2y + e^{xy^2}\,2y)$$

$$\frac{\delta M}{\delta y} = 2\sin x\cos x - 1 + 4y^3 e^{xy^2} x + 4ye^{x^2}$$

$$\frac{\delta N}{\delta x} = -1 + \sin 2x + 4ye^{y^2 x} + 4y^3 x e^{xy^2}$$

$$\boxed{\frac{\delta M}{\delta y} = \frac{\delta N}{\delta x}}$$ equation is exact.

There exists a solution $f(x,y) = C$ such that

$$\frac{\delta f}{\delta x} = M(x,y) = 2y \sin x \cos x - y + 2y^2 e^{xy^2}$$

$$\int \frac{\delta f}{\delta x} dx = \int \left(y \sin 2x - y + 2y^2 e^{xy^2} \right) dx$$

$$f(x,y) = \frac{-1}{2} \cos(2x) \cdot y - xy + 2e^{xy^2} + g(y)$$

$$= -\frac{1}{2} y \left(1 - 2\sin^2 x\right) - xy + 2e^{xy^2} + g(y)$$

$$\Rightarrow f(x,y) = -\frac{1}{2} y + y \sin^2 x - xy + 2e^{xy^2} + g(y)$$

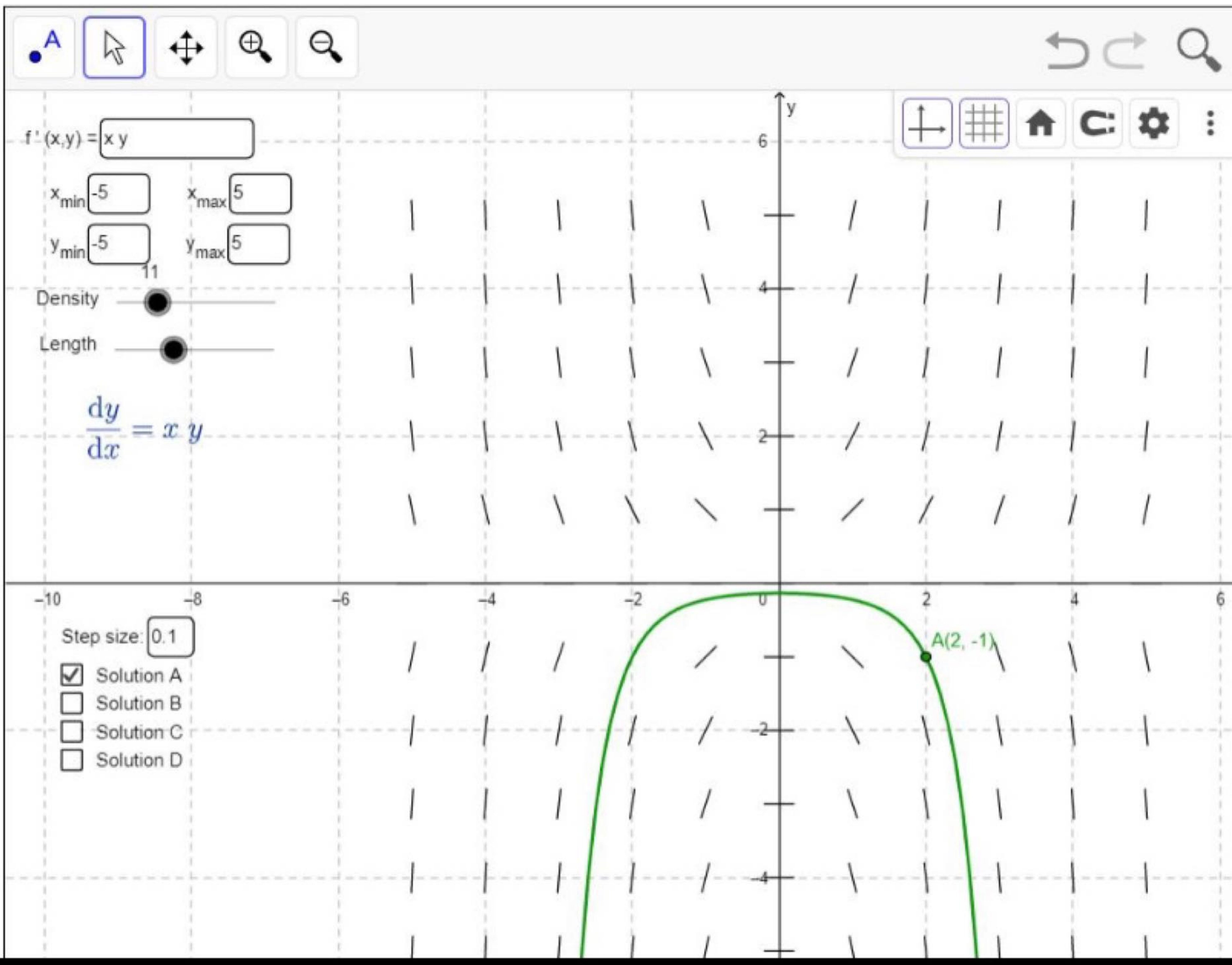
and $\frac{\delta f}{\delta y} = N(x,y) = -x + \sin^2 x + 4xy e^{xy^2}$

so, $-\frac{1}{2} + \sin^2 x - x + 4xy e^{xy^2} + g'(y) = -x + \sin^2 x + 4xy e^{xy^2}$

or, $\int g'(y)\, dy = \int \frac{1}{2}\, dy$

$\therefore g(y) = \frac{y}{2}$

so, $y \sin^2 x - xy + 2e^{xy^2} = C$



f ' (x,y) = x y
x min -5
x max 5
y min -5
y max 5
11
Density
Length
$\frac{dy}{dx} = x\,y$
Step size: 0.1
Solution A
Solution B
Solution C
Solution D
A(2, -1)
y