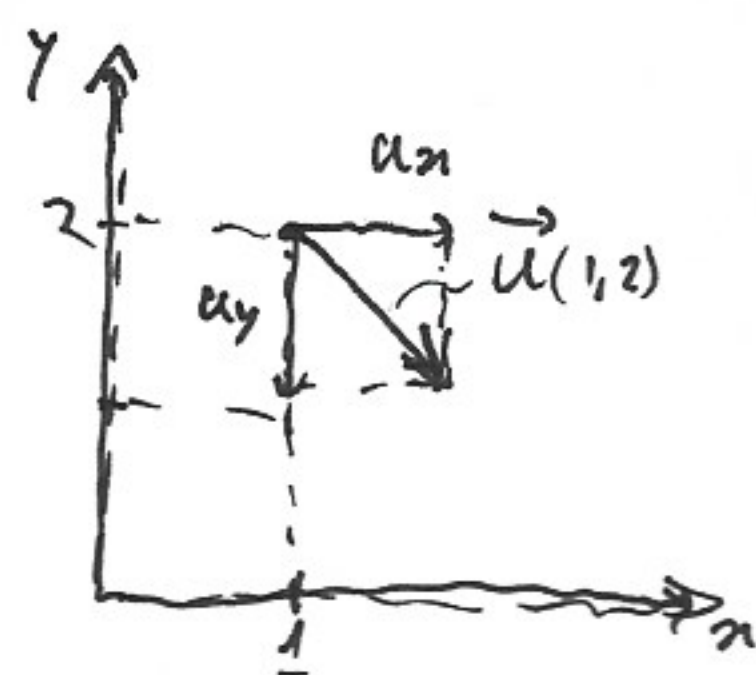


P3

$$\vec{u} = 2x \vec{e}_x - y \vec{e}_y$$

a) velocidades em (1,2)

$$\vec{u}(1,2) = 2 \vec{e}_x - 2 \vec{e}_y \text{ (ms}^{-1}\text{)}$$



$$|\vec{u}| = \sqrt{2^2 + (-2)^2} = \sqrt{8} \text{ m/s}$$

0,5

b)

$$\frac{dx}{u} = \frac{dy}{v} \Rightarrow \frac{dx}{2x} = \frac{dy}{-y} \Rightarrow \int_{x_0}^x \frac{1}{x} dx = -2 \int_{y_0}^y \frac{1}{y} dy \Rightarrow \ln \frac{x}{x_0} = -2 \ln \frac{y}{y_0}$$

0,5

$$\Rightarrow \ln \frac{x}{x_0} + 2 \ln \frac{y}{y_0} = 0 \Rightarrow \ln \left(\frac{x}{x_0} \left(\frac{y}{y_0} \right)^2 \right) = 0 \Rightarrow \frac{x}{x_0} \frac{y^2}{y_0^2} = 1$$

$$\boxed{xy^2 = x_0 y_0^2}$$

FAMÍLIA DE LÍNIAS DE CORRENTE

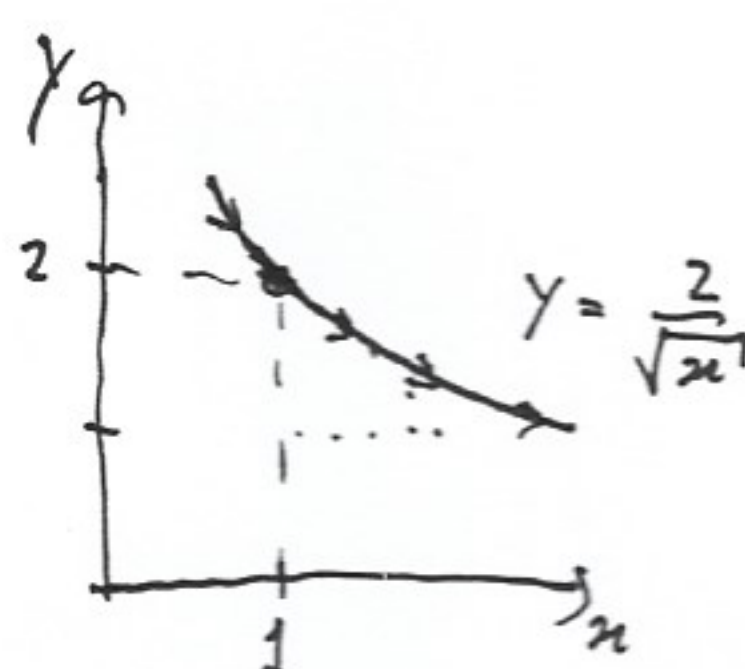
0,5

$$\text{e } x_0 = 1, y_0 = 2$$

$$\boxed{xy^2 = 4}$$

$$y = \frac{2}{\sqrt{x}}$$

0,5



c)

$$\text{Incompressibilidade } \vec{\nabla} \cdot \vec{u} = 0$$

0,5

$$\vec{\nabla} \cdot \vec{u} = \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = \frac{\partial 2x}{\partial x} + \frac{\partial -y}{\partial y} + 0 = 2 - 1 = 1 \neq 0$$

O FLUIDO É

COMPRESSÍVEL

1,0

d)

É UM ESCOAMENTO PERMANENTE, OU ESTACIONÁRIO $\rightarrow \frac{\partial \vec{u}}{\partial t} = 0$

1,0

$$\text{É VARIADO } \rightarrow \vec{\nabla} \cdot \vec{u} \equiv \frac{\partial u_i}{\partial x_i} \neq 0$$

1,0