

⑤ consider the vector field

$$F = \left\langle \frac{x}{x^2+y^2}, \frac{y}{x^2+y^2} \right\rangle$$

which is defined at all of the plane except for the origin. IS F conservative?

If conservative $\vec{F} = \nabla f \leftarrow$ some function.

$$f_x = \frac{x}{x^2+y^2}$$

$$f_y = \frac{y}{x^2+y^2}$$

$$f(x,y) = \frac{1}{2} \ln(x^2+y^2) + h(y) \quad (\text{get by integrating } f_x \text{ wrt } x)$$

$$f_y(x,y) = \frac{1}{2} \left(\frac{1}{x^2+y^2} \right) 2y + h'(y) \quad (\text{take partial derivative wrt } y)$$

$$= \frac{y}{x^2+y^2} + h'(y) \quad \text{so } h'(y) = 0$$

$$f = \frac{1}{2} \ln(x^2+y^2)$$

F is conservative because it can be expressed as $\vec{F} = \nabla f$.