> $restart : with(LinearAlgebra) : with(plots) : with(plottools) : with(inttrans) :$
   $with(VectorCalculus) : SetCoordinates('cartesian'[x, y, z]) :$

> $F := VectorField\left(\left[-\dfrac{alpha \cdot y}{r^2}, \dfrac{alpha \cdot x}{r^2}, 0\right]\right)$

$$F := \left(-\dfrac{\alpha\, y}{r^2}\right)\bar{e}_x + \left(\dfrac{\alpha\, x}{r^2}\right)\bar{e}_y + (0)\bar{e}_z \tag{1}$$

> $Curl(simplify(F))$

$$(0)\bar{e}_x + (0)\bar{e}_y + \left(\dfrac{2\,\alpha}{r^2}\right)\bar{e}_z \tag{2}$$

> $F := VectorField\left(\left[-\dfrac{alpha \cdot y}{x^2 + y^2}, \dfrac{alpha \cdot x}{x^2 + y^2}, 0\right]\right)$

$$F := \left(-\dfrac{\alpha\, y}{x^2 + y^2}\right)\bar{e}_x + \left(\dfrac{\alpha\, x}{x^2 + y^2}\right)\bar{e}_y + (0)\bar{e}_z \tag{3}$$

> $simplify(Curl(simplify(F)))$

$$(0)\bar{e}_x + (0)\bar{e}_y + (0)\bar{e}_z \tag{4}$$

> $\#\ IV$
> $int(r, theta = 0 .. 2 \cdot Pi)$

$$2\, r\, \pi \tag{5}$$

>