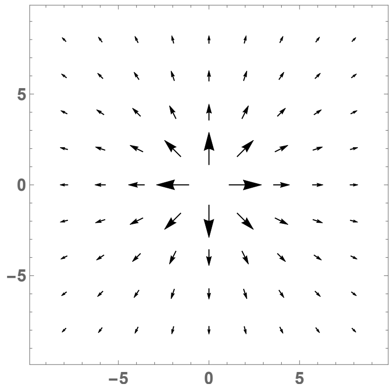
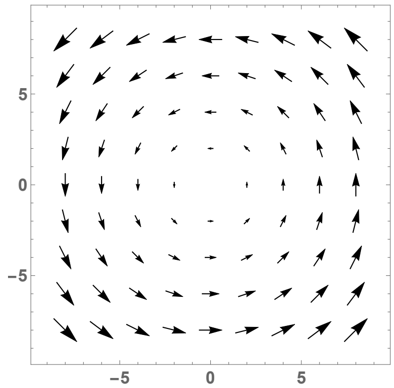
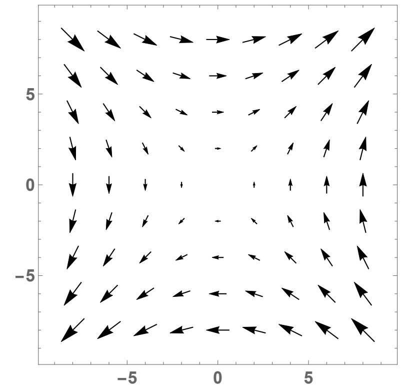
$$\mathbf{F}(x,y) = \left\langle \frac{x}{x^2+y^2}, \frac{y}{x^2+y^2} \right\rangle$$



$$\mathbf{F}(x,y) = \Big\langle -y, x \Big\rangle$$



$$\mathbf{F}(x,y) = \Big\langle y, x \Big\rangle$$

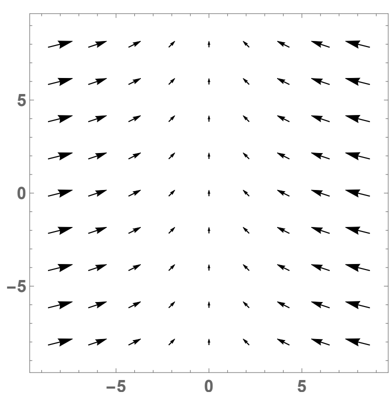


A

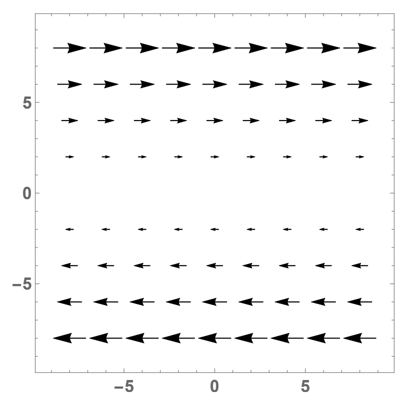
B

C

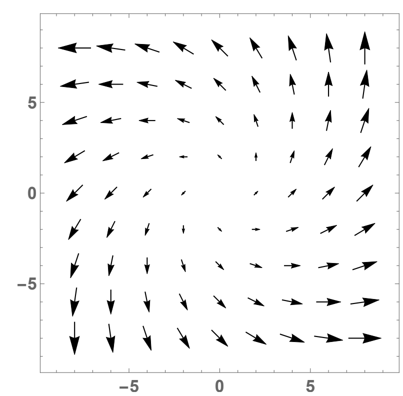
$$\mathbf{F}(x,y) = \Big\langle -x, 2 \Big\rangle$$



$$\mathbf{F}(x,y) = \Big\langle y, 0 \Big\rangle$$



$$\mathbf{F}(x,y) = \Big\langle x-y, x+y \Big\rangle$$



D

E

F

$\mathbf{F}$ is conservative, because $\mathbf{F} = \nabla f$, where $f = \frac{1}{2}\ln(x^2 + y^2)$

1

$\mathbf{F}$ is conservative, because $\mathbf{F} = \nabla f$, where $f = xy$

3

$\mathbf{F}$ is conservative, because $\mathbf{F} = \nabla f$, where $f = -\frac{1}{2}x^2 + 2y$

10

$\mathbf{F}$ is not conservative, because the derivative of its $x$-component with respect to $y$ is 1 and derivative of the $y$-component with respect to $x$ is 0, and thus they are not the same.

5

$\mathbf{F}$ is not conservative, because $\int_C \mathbf{F} \cdot d\mathbf{r}$ is not path-independent. A counter-clockwise semi-circular path from $(0, 5)$ to $(0, -5)$ gives a positive value while a clockwise path gives a negative value.

6

$\mathbf{F}$ is not conservative, because $\int_C \mathbf{F} \cdot d\mathbf{r}$ is not path-independent. A counter-clockwise semi-circular path from $(0, 5)$ to $(0, -5)$ gives a positive value while a clockwise path gives a negative value.

6

$\mathbf{F}$ is not conservative, because there are closed paths for which $\int_C \mathbf{F} \cdot d\mathbf{r}$ is not 0. For example, the line integral along a counter-clockwise circle of radius 5 centered at the origin is negative.

11

The value of $\int_C \mathbf{F} \cdot d\mathbf{r}$ for any path from $(5, 5)$ to $(0, 5)$ is always positive.

4

The value of $\int_C \mathbf{F} \cdot d\mathbf{r}$ for any path from $(5, 5)$ to $(0, 5)$ is always -25.

9

$\mathbf{F}$ is not conservative because the anti-derivative of $y$ with respect to $x$ is $xy + c(y)$, and the anti-derivative of 0 with respect to $y$ is $k(x)$. These two functions cannot be made equal by the choice of the constants.

17

$\mathbf{F}$ is conservative, because the derivative of its $x$-component with respect to $y$ and the derivative of its $y$-component with respect to $x$ are both 1, and thus the same.

15

$\mathbf{F}$ is not conservative, because the the curl of $\langle x - y, x + y, 0 \rangle$ is not 0.

12