

1. For each of the following, graph the vector field and the curve to determine whether

$\int_C \vec{F} \cdot d\vec{r}$ is positive, negative or zero.

a. $\vec{F} = y\vec{i} - x\vec{j}$, C is the curve parameterized by

$$x = \cos t$$

$$y = \sin t$$

$$0 \leq t \leq \pi$$

b. $\vec{F} = y\vec{i} - x\vec{j}$, C is the curve parameterized by

$$x = \sin t$$

$$y = \cos t$$

$$0 \leq t \leq \pi$$

c. $\vec{F} = y\vec{i} - x\vec{j}$, C is the curve parameterized by

$$x = t$$

$$y = t$$

$$0 \leq t \leq 2$$

d. $\vec{F} = y\vec{i} - x\vec{j}$, C is the curve parameterized by

$$x = t^2 + 1$$

$$y = 2t^2$$

$$0 \leq t \leq 1$$

e. $\vec{F} = y\vec{j}$, C is the curve parameterized by

$$x = \cos t$$

$$y = \sin t$$

$$0 \leq t \leq \pi$$

f. $\vec{F} = xy\vec{i} - (y^2 - x^2)\vec{j}$, C is the curve parameterized by

$$x = \sin t$$

$$y = \cos t$$

$$0 \leq t \leq 2\pi$$

g. $\vec{F} = xy\vec{i} - (y^2 - x^2)\vec{j}$, C is the curve parameterized by

$$x = 2 \cos t$$

$$y = 2 \sin t$$

$$0 \leq t \leq \frac{\pi}{4}$$

Yesterday we say that if $\vec{F}(x, y)$ is a vector field, and C is a curve parametrized by $\vec{r}(t)$, $t = a..b$, then

$$\int_C \vec{F} \cdot d\vec{r} = \int_a^b \vec{F}(\vec{r}(t)) \cdot \vec{r}'(t) dt$$

Note that $\vec{F}(\vec{r}(t)) \cdot \vec{r}'(t)$ is a function of t , so the integral on the right is just a regular old integral that you can compute using the usual techniques - by hand or using technology.

2. For each vector field and curve on the first page, set up and compute $\int_C \vec{F} \cdot d\vec{r}$.

a.

b.

c.

d.

e.

f.

g.

3. We can also apply the same process to 3d vector fields and curves. For each of the following graph the vector field and curve, then compute $\int_C \vec{F} \cdot d\vec{r}$.

a. $\vec{F} = y\vec{i} - x\vec{j} + \vec{k}$, C is the curve parameterized by

$$x = \sin t$$

$$y = \cos t$$

$$z = t$$

$$0 \leq t \leq \pi$$

b. $\vec{F} = x\vec{j} + z\vec{k}$, C is the curve parameterized by

$$x = 2t$$

$$y = 3$$

$$z = 2$$

$$0 \leq t \leq 2$$

c. $\vec{F} = x\vec{j} + z\vec{k}$, C is the curve parameterized by

$$x = 1 - t^2$$

$$y = t$$

$$z = t$$

$$-1 \leq t \leq 1$$