

Taker Name:

Key

GTID: 90

Section:

Grader #1:

GTID: 90

§16.2: Flow and Flux

Find the Circulation of the field $\mathbf{F}$ for the ellipse C , parameterized by $\mathbf{r}(t) = \cos t \mathbf{i} + 4 \sin t \mathbf{j}$, oriented counter-clockwise.

Formula

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

$$\text{Flow} = \int_C \mathbf{F} \cdot \mathbf{T} \, ds$$

$$\mathbf{r}(t) = \langle \cos t, 4 \sin t \rangle \quad t \in [0, 2\pi]$$

$$\mathbf{r}'(t) = \langle -\sin t, 4 \cos t \rangle$$

$$\text{Flow} = \int_0^{2\pi} \langle -4 \sin t, \cos t \rangle \cdot \langle -\sin t, 4 \cos t \rangle \, dt$$

$$= \int_0^{2\pi} 4 \sin^2 t + 4 \cos^2 t \, dt = \int_0^{2\pi} 4 \, dt$$

$$= 4t \Big|_0^{2\pi} = 8\pi - 0 = 8\pi$$

A

J

N

G2:

A

J

N

G3:

A

J

N