Mazhar Mofiz Arman
1921079642

$x = 2\cos t$, $y = 2\sin t$ for $0 \le t \le \frac{3\pi}{2}$

Formula :

$$L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

Ans:

Given,

$x = 2\cos t$.

$\Rightarrow \frac{dx}{dt} = \frac{d}{dt}(2\cos t)$.

$\Rightarrow \frac{dx}{dt} = -2\sin t$.

$\Rightarrow \left(\frac{dx}{dt}\right)^2 = 4\sin^2 t$

$y = 2\sin t$

$\Rightarrow \frac{dy}{dt} = \frac{d}{dt}(2\sin t)$.

$\Rightarrow \frac{dy}{dt} = 2\cos t$.

$\Rightarrow \left(\frac{dy}{dt}\right)^2 = 4\cos^2 t$.

$\therefore \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 = 4\sin^2 t + 4\cos^2 t$.

$= 4(\sin^2 t + \cos^2 t) = 4$.

## Length of the curve:

$$L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt.$$

$$= \int_0^{\frac{3\pi}{2}} \sqrt{4}\, dt.$$

$$= \int_0^{\frac{3\pi}{2}} 2\, dt.$$

$$= [2t]_0^{\frac{3\pi}{2}}.$$

$$= \left[2 \cdot \frac{3\pi}{2}\right] - [2.0]$$

$$= 3\pi$$

(Ans).