

Answer on Question #70498 - Math - Geometry

Q. Find the length of the astroid $x = a\cos 3t, y = a\sin 3t, t \in [0, 2\pi]$.

Solution:

$$\begin{aligned} l &= \int_0^{2\pi} \sqrt{[x'(t)]^2 + [y'(t)]^2} dt = \int_0^{2\pi} \sqrt{(-3a\sin 3t)^2 + (3a\cos 3t)^2} dt = \\ &= 3a \int_0^{2\pi} \sqrt{\sin^2 3t + \cos^2 3t} dt = 3a \int_0^{2\pi} dt = 6\pi a \end{aligned}$$

Answer:

Length of the asteroid equals $6\pi a$.

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