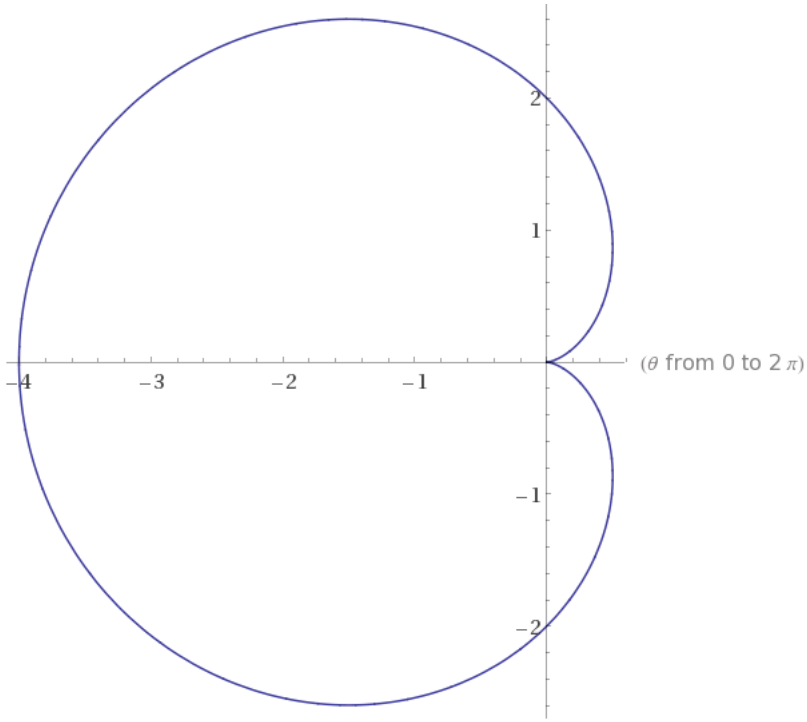
Answer on Question#35081 – Math – Calculus

Find the perimeter of the curve r = a(1− cosq).

Solution.

Sketch the graph of this function: $r = a(1 - \cos\theta)$.



The length s of the part of the graph of f between $x = a$ and $x = b$ can be found as follows:

$$s = \int_a^b \sqrt{1 + (f'(x))^2}\, dx.$$

If a function is defined in polar coordinates by $r = f(\theta)$ then the arc length is given by

$$s = \int_a^b \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta.$$

Thus, we have

$$s = \int_0^{2\pi} \sqrt{a^2(1 - \cos\theta)^2 + a^2 \sin^2\theta}\, d\theta = a\int_0^{2\pi} \sqrt{2 - 2\cos\theta}\, d\theta = 8.$$

Answer.

$\boldsymbol{s = 8.}$