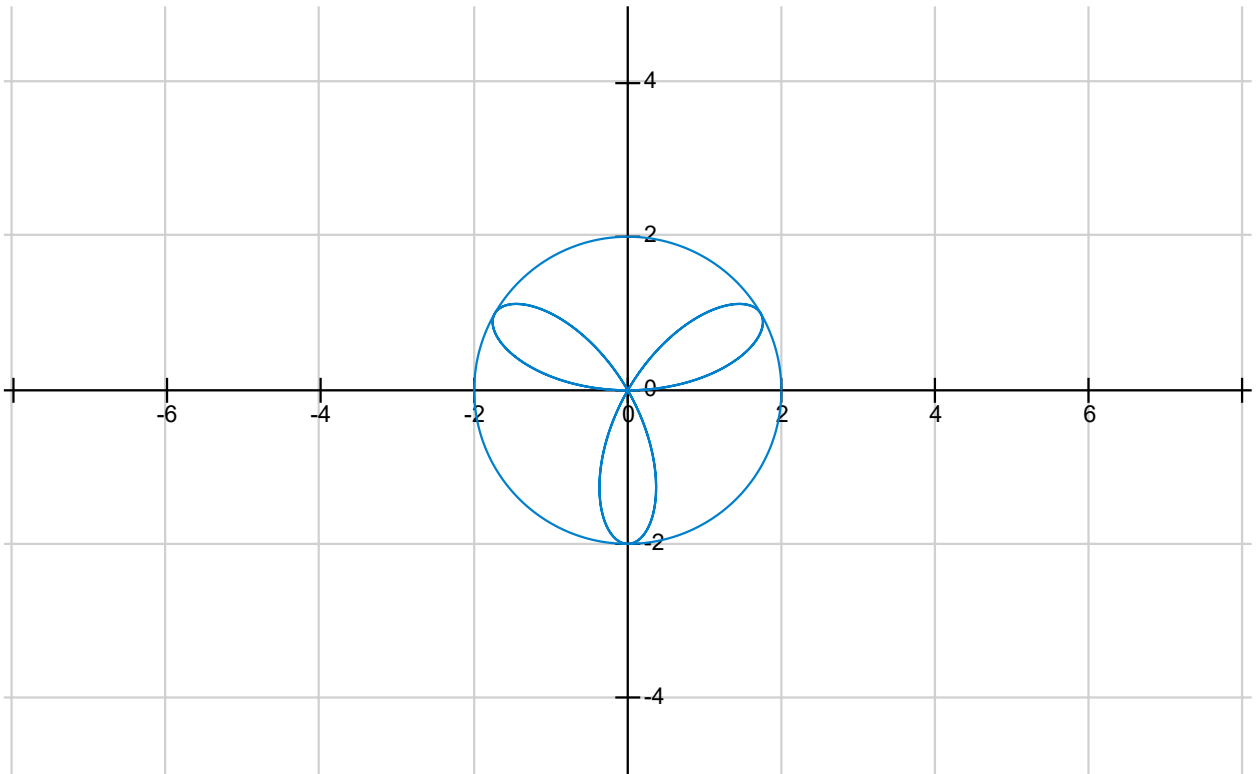


Answer on Question #76404 – Math – Calculus

Question

1. Trace the area between the curves $r=2$ and $r = 2 \sin 3\theta$ and then find this area.

Solution



Let us construct curves: <https://www.desmos.com/calculator/inaibaqcmv>

The required area is equal to the difference between the area of the circle and the three areas of the region $r = 2 \sin 3\theta$ on the interval $[0; \pi/3]$.

Then

$$\begin{aligned} S &= \pi r^2 - 3 \int_0^{\pi/3} (2 \sin 3\theta)^2 d\theta = \pi r^2 - \frac{3}{2} \int_0^{\pi/3} 4 \sin^2 \theta d\theta \\ S &= \pi r^2 - 6 \int_0^{\pi/3} \frac{1}{2} (1 - \cos 6\theta) d\theta = \pi r^2 - 3 \left(\int_0^{\pi/3} d\theta - \int_0^{\pi/3} \cos 6\theta d\theta \right) \\ S &= \pi r^2 - 3 \left(\theta - \frac{1}{6} \sin 6\theta \right) \end{aligned}$$

After substitution: $r=2$ and considering $\sin 6\theta = 0$ for $\theta=0$ and $\theta=\frac{\pi}{3}$

$$S = 4\pi - \pi = 3\pi$$

Answer: 3π

Answer provided by <https://www.AssignmentExpert.com>