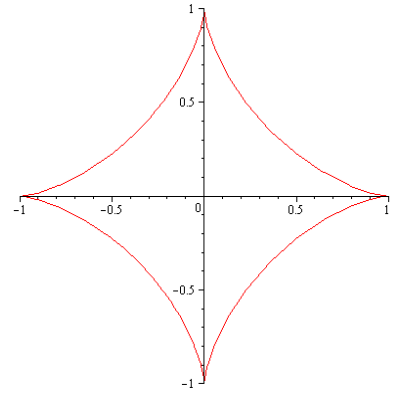


1. Find the area of the astroid defined by the parametric equations $x = a \cos^3 t$ and $y = a \sin^3 t$, where $0 \leq t \leq 2\pi$.
2. Calculate the volume of the vertical cylinder $(x-a)^2 + y^2 = a^2$ between the planes $z = 0$ and $z = 4a-x$.
3. Calculate the work done by the force $\mathbf{F} = 3x^2 \mathbf{i}$ along the line in the x - y plane from $(1,3)$ to $(2,4)$.
4. Calculate the work done by the force $\mathbf{F} = 3x^2 \mathbf{i}$ along one half of the cardioid $r = 6(1+\cos\varphi)$ for $0 \leq \varphi \leq \pi$.
5. What is the moment of inertia of a flat uniform annulus between the limits $a \leq r \leq b$, when it is rotated about an axis through its centre and perpendicular to its plane?
6. What is the moment of inertia of the cone defined by $x^2 + y^2 = a^2 z^2$ for $0 \leq z \leq 1$ if the axis of rotation corresponds to the z axis?
7. What is the moment of inertia of the cone defined by $x^2 + y^2 = a^2 z^2$ for $0 \leq z \leq 1$ if the axis of rotation corresponds to the x axis?



An astroid