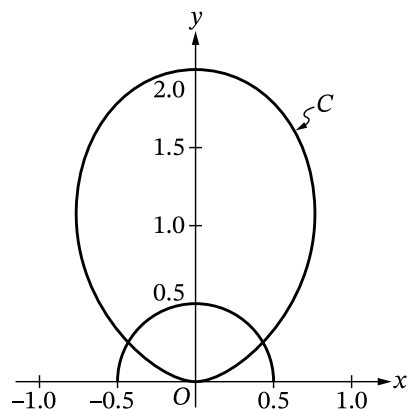


2. Curve C is defined by the polar equation $r(\theta) = 2 \sin^2 \theta$ for $0 \leq \theta \leq \pi$. Curve C and the semicircle $r = \frac{1}{2}$ for $0 \leq \theta \leq \pi$ are shown in the xy -plane.



(Note: Your calculator should be in radian mode.)

- A. Find the rate of change of r with respect to θ at the point on curve C where $\theta = 1.3$. Show the setup for your calculations.
- B. Find the area of the region that lies inside curve C but outside the graph of the polar equation $r = \frac{1}{2}$. Show the setup for your calculations.
- C. It can be shown that $\frac{dx}{d\theta} = 4 \sin \theta \cos^2 \theta - 2 \sin^3 \theta$ for curve C . For $0 \leq \theta \leq \frac{\pi}{2}$, find the value of θ that corresponds to the point on curve C that is farthest from the y -axis. Justify your answer.
- D. A particle travels along curve C so that $\frac{d\theta}{dt} = 15$ for all times t . Find the rate at which the particle's distance from the origin changes with respect to time when the particle is at the point where $\theta = 1.3$. Show the setup for your calculations.

END OF PART A