

WARM UP - No Calculator

1. What are the value of x for which the function f defined by $f(x) = (x^2 - 3)e^{-x}$ is increasing?

2. $\lim_{x \rightarrow 1} \frac{x}{\ln x}$ is

(A) 0

(B) $\frac{1}{e}$

(C) 1

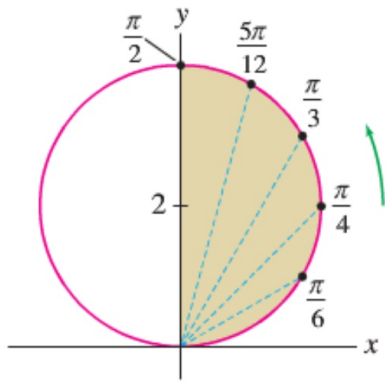
(D) e

(E) nonexistent

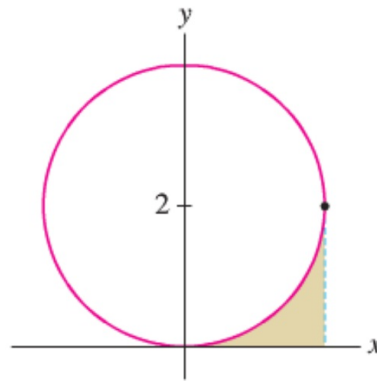
POLAR AREA

Objective:

- Find the area bounded by a polar curve.

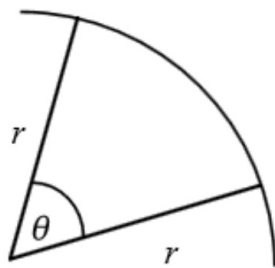


(A) The polar integral computes the area swept out by a radial segment.

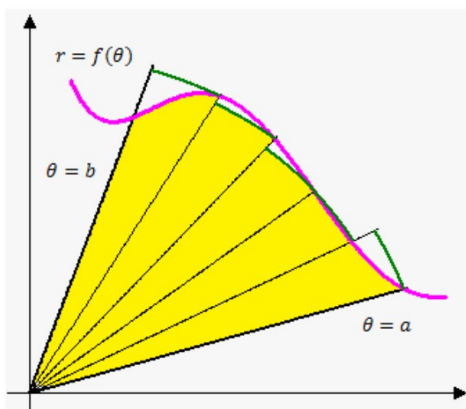


(B) The ordinary integral in rectangular coordinates computes the area underneath a curve.

Area of a Sector



The area of a sector of a circle with radius r and central angle θ is given by $A = \frac{1}{2}\theta r^2$ provided that θ is measured in radians.



Area in Polar Coordinates

The area of the region between the origin and the curve $r = f(\theta)$ for $\alpha \leq \theta \leq \beta$ is

$$A = \int_{\alpha}^{\beta} \frac{1}{2} r^2 d\theta = \int_{\alpha}^{\beta} \frac{1}{2} (f(\theta))^2 d\theta.$$

Example 1: Find the area bound by the graph of $r = 2 + 2 \sin \theta$

Example 2: Find the area of one petal
of $r = 2 \sin 3\theta$

Example 3: Find the area of one petal
of $r = 4 \cos 2\theta$

Example 4: Find the area of the inner loop of $r = 2 + 4\cos\theta$.

Example 5: Find the area of the region lying between the inner and outer loops of the limaçon $r = 1 - 2\sin\theta$

