

WARM UP - Calculator Active

1. A particle is moving along a curve where $x(t) = t^2 - 4t + 8$ and $y(t)$ is not explicitly given and $\frac{dy}{dt} = te^{t-3} - 1$

- a. Find the time, $0 < t < 4$, when the line tangent to the path of the particle is horizontal.
- b. Is the direction of the motion of the particle towards the left or right at that time? Explain.

POLAR AREA (Day 2)

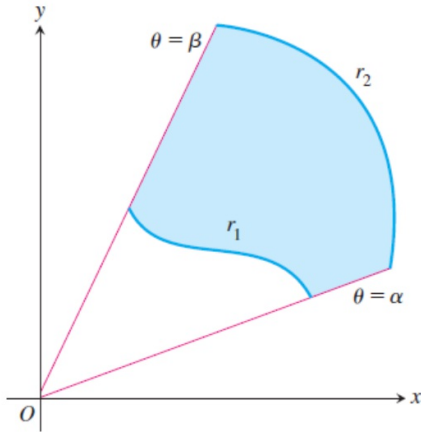
Objective:

- Find the area of regions between polar curves.

Area Between Polar Curves

The area of the region between $r_1(\theta)$ and $r_2(\theta)$ for $\alpha \leq \theta \leq \beta$ is

$$A = \int_{\alpha}^{\beta} \frac{1}{2} r_2^2 d\theta - \int_{\alpha}^{\beta} \frac{1}{2} r_1^2 d\theta = \int_{\alpha}^{\beta} \frac{1}{2} (r_2^2 - r_1^2) d\theta.$$



Note: just because there are 2 curves, doesn't always mean that you'll have to use this formula.

Example 1: Find the area of the region that is inside $r = 3\sin\theta$ and outside $r = 2 - \sin\theta$.

Example 2: Find the area of the common interior of $r = 3\cos\theta$ and $r = 1 + \cos\theta$.

Example 3: Find the area of the region inside the circle $r = 2\cos\theta$ but outside the circle $r = 1$.

CLASSWORK:

1. Find the area inside $r = 3 + 2\sin\theta$ and outside $r = 2$.

2 Find the area outside $r = 3 + 2\sin\theta$ and inside $r = 2$.

3. Find the area inside both $r = 3 + 2\sin\theta$ and $r = 2$