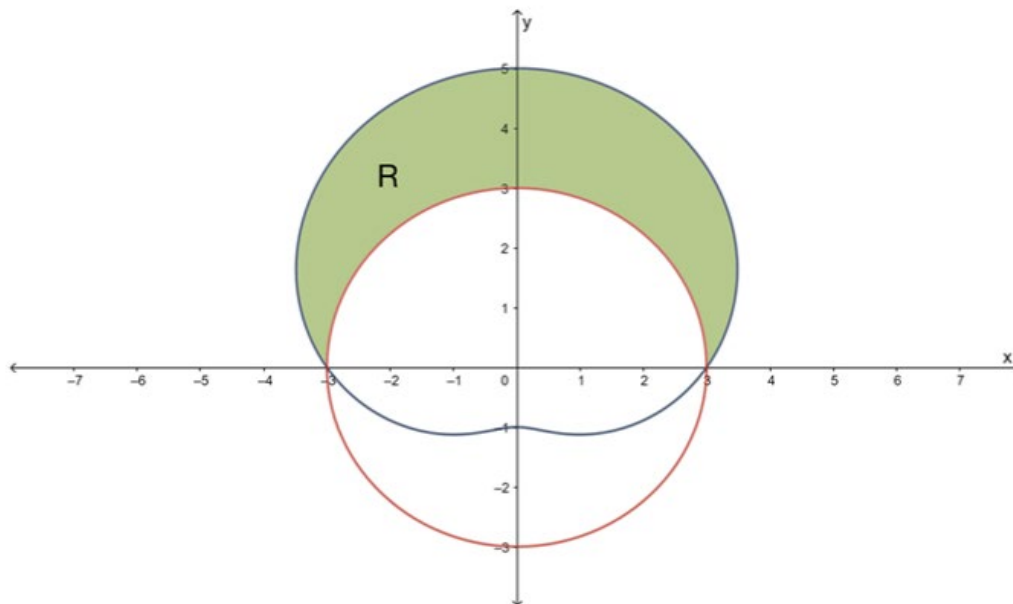


BC Module 9 DBA:

This is a CALCULATOR REQUIRED assignment. Please show all your work to support your answers.

1. The graphs of the polar curves $r = 3$ and $r = 3 + 2\sin\theta$ are shown.



Part A: Find where the two curves intersect. Show the work that leads to your answer.

Part B: Let R be the shaded region that is inside the graph of $r = 3 + 2\sin\theta$ and outside the graph of $r = 3$, as shown in the graph. Write an expression involving an integral and solve for the area of R.

Part C: A satellite's path orbiting a stellar object moves along the polar curve $r = 3 + 2\sin\theta$ for $0 \leq \theta \leq \pi$. The satellite's distance to the center of the stellar object increases at a constant rate of 2.5 units per second. Find the rate at which the angle θ changes with respect to time at the instant when the position of the satellite corresponds to $\theta = \frac{\pi}{4}$. Include your units or measurement in the final answer.

2. A particle moving along a curve in the plane has position $(x(t), y(t))$ at time t where

$$\frac{dx}{dt} = 7e^{-t} - 2e^t \quad \text{and} \quad \frac{dy}{dt} = \sqrt{2t^4 + t + 6}$$

for all real values of t . At time $t=0$, the particle is at the point $(-7, 2)$.

- a) Find the speed of the particle and its acceleration vector at time $t=0$.
- b) Find the equation of the tangent line to the path of the particle at time $t=0$.
- c) Set up but do not evaluate an expression that would give the total distance traveled by the particle over the time interval $0 \leq t \leq 4$
- d) Find the x-coordinate of the position of the particle at time $t = 4$.