A moving particle has position $\langle x(t), y(t) \rangle$ at time t. The position of the particle at time t=1 is (2,6). And the velocity vector at any time t>0 is given by

$$\vec{\mathbf{v}} = \left\langle 1 - \frac{1}{t^2}, 2 + \frac{1}{t^2} \right\rangle$$

a) Find the acceleration vector at time t=3

b) Find the position of the particle at time t=3

c) For what time $t > 0$ does the line tangent to the path of the particle at $\langle x(t), y(t) \rangle$ have slope 8?

d)The particle approaches a line as $t \to \infty$ Find the slope of this line. Show the work that leads to this conclusion.

Bc4 2000

Sketch the polar graph of $r = 2\cos(\theta) - 1$

Find the maximum and minimum values of r

Find all points on the curve that have a horizontal tangent

Sketch of the graph of $r = 1 - \cos(\theta)$

Find to all vertical tangents

Find all horizontal tangents

Write the rectangular equation of $r = \cos(\theta)$

Find that the slope of the tangent to the curve when $\theta = \pi$

Find the area enclosed by the curve

Find all points where the curve intersects with the graph of $r = \sin(\theta)$

Find the area inside $r = \cos\left(\theta\right)$ and outside $r = 1 - \cos\left(\theta\right)$

Sketch and find the length of $r = e^{2\theta}$ from 0 to 2π

BC 4 AP 1993 noncalculator

Consider the polar curve $r = 2\sin\left(3\theta\right)$ for $0 \le \theta \le \pi$

(a) Sketch the curve

(b) Find the area of the region inside the curve

(C) Find the slope of the curve at the point where $\theta = \dfrac{\pi}{4}$

A roller coaster track has an inverted loop as a portion of its course. The position of the car on the track (in feet) at time t seconds, $0 \le t \le 7$ is given by

$$x = 5t - 12\sin\left(t+2\right) + 10$$

$$y = 15 + 12\cos\left(t+2\right)$$

When is the car at the top of the loop and what is its speed at that time?

$$x(t) = t^2 - t$$

$$y(t) = e^{2t}$$

Determine $\dfrac{d^2y}{dx^2}$ At the point where t=2

$$x(t) = \cos^3(t)$$
$$y(t) = \sin^3(t)$$

Sketch the graph determined by the vector function

Find the length of the astroid you just graphed.

Find the surface area of the region formed when the curve is rotated about the y-axis

Sketch one arc of the cycloid with equations

$$x(t) = t - \sin(t)$$

$$y(t) = 1 - \cos(t)$$

Find the area under one arc of the cycloid

Find the length of one arc of the cycloid

Find the surface area of the region determined by rotating one arc of the cycloid about the x-axis

Find the volume of the region determined by rotating one arc of the cycloid about the x-axis

Determine the surface area of the region formed by rotating

$$y = \arcsin(x)$$

Around the y-axis