Short Answer AP Exam questions:

1987 - BC 5

ıe position of a particle moving in the xy-plane at any time t, $0 \leq t \leq 2\pi$, is given by the parametric equations $x = \sin t$ and $y = \cos(2t)$.

a) Find the velocity vector for the particle at any time t, $0 \leq t \leq 2\pi$.
b) For what values of t is the particle at rest?
c) Write an equation for the path of the particle in terms of x and y that does NOT involve trigonometric functions.
d) Sketch the path of the particle.

1994 - BC 3

A particle moves along the graph of $y = \cos x$ so that the x-component of acceleration is always 2. At time $t = 0$, the particle is at the point $(\pi, -1)$ and the velocity vector of the particle is (0, 0).

a) Find the x- and y- coordinates of the position of the particle in terms of t.
b) Find the speed of the particle when its position is (4, cos 4).

1995 - BC 1

Two particles move in the xy-plane. For time $t>0$, the position of particle A is given by $x = t - 2$ and $y = (t - 2)^2$, and the position of particle B is given by $x = \frac{3t}{2} - 4$ and $y = \frac{3t}{2} - 2$.

a) Find the velocity vector for each particle at time t = 3.
b) Set up an integral expression that gives the distance traveled by particle A from t = 0 to t = 3. Do not evaluate.
c) Determine the exact time at which the particles collide; that is, when the particles are at the same point at the same time. Justify your answer.

1989 - BC 4

Consider the curve given by the parametric equations $x = 2t^3 - 3t^2$ and $y = t^3 - 12t$.

a) In terms of t, find dy/dx.
b) Write an equation for the line tangent to the curve at the point where t = -1.
c) Rind the x- and y-coordinates for each critical point on the curve and identify each point as having a vertical or horizontal tangent.

1993 - BC 2

The position of a particle at any time t > 0 is given by $x(t) = t^2 - 3$ and $y(t) = \frac{2}{3}t^3$.

a) Find the magnitude of the velocity vector at t = 5.
b) Find the total distance traveled by the particle from t = 0 to t = 5.
c) Find dy/dx as a function of x.

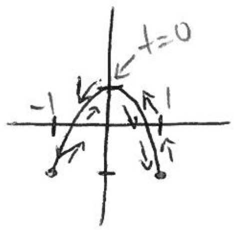
1987 BC-5

a) $\vec{v}(t) = \langle x'(t), y'(t) \rangle = \langle \cos t, -2\sin(2t) \rangle$

b) at rest when $\vec{v}(t) = \langle 0, 0 \rangle$ $t = \frac{\pi}{2}$ and $t = \frac{3\pi}{2}$

c) $\cos 2t = 1 - 2\sin^2 t \Rightarrow y = 1 - 2x^2$

d)



1994 BC-3

a) $x''(t) = 2$ $x'(t) = \int 2\,dt = 2t + c$ $x'(0) = 0 = c$ $x'(t) = 2t$

$x(t) = \int 2t\,dt = t^2 + c,$ $x(0) = \pi = c,$ $\boxed{x(t) = t^2 + \pi}$

$\boxed{y(t) = \cos(t^2 + \pi)}$

b) $t^2 + \pi = 4 \Rightarrow t = \sqrt{4 - \pi}$ speed $= \sqrt{(x')^2 + (y')^2}$

speed $= \sqrt{(2\sqrt{4-\pi})^2 + (-2\sqrt{4-\pi}\sin((\sqrt{4-\pi})^2 + \pi))^2} =$

1995 - BC 1

a) A $\vec{V}(t) = \langle 1, 2(t-2) \rangle$ B $\vec{v}(t) = \langle \frac{3}{2}, \frac{3}{2} \rangle$

$\vec{V}_A(3) = \langle 1, 2 \rangle$ $\vec{V}_B(3) = \langle 3/2, 3/2 \rangle$

b) $\int_0^3 \sqrt{(1)^2 + (2t-4)^2}\,dt$

c) $t - 2 = \frac{3t}{2} - 4$ at $t = 4$ A $(2,4)$ At $t=4$ both A+B at $(2,4)$

B $(2,4)$

$t = 4$

1989 - BC 4

a) $\frac{dy}{dx} = \frac{3t^2-12}{6t^2-6t}$

b) at $t=-1$ $(-5, 11)$ $\left.\frac{dy}{dx}\right|_{t=-1} = -\frac{9}{12} = \frac{-3}{4}$

$\boxed{y-11 = -\frac{3}{4}(x+5)}$

c) crit pts at $3t^2-12=0$ $t=\pm 2$

$6t^2-6t=0$ $t=0,1$

crit pts $(4,-16)$ $(-28,16)$ $\Rightarrow$ horiz tangents

$(0,0)$ + $(-1,-11)$ $\Rightarrow$ vert tangents

1993 BC-2

a) $|\vec{v}(t)| = \sqrt{(2(5))^2 + (2(5)^2)^2} = 50.9902$

b) $\int_0^5 \sqrt{(2t)^2+(2t^2)^2}\, dt = 87.716$

c) $\frac{dy}{dx} = \frac{\overset{dy/dt}{2t^2}}{\underset{dx/dt}{2t}} = t$

$x = t^2 - 3$ $t = \sqrt{x+3}$ since $t \geq 0$

$\boxed{\frac{dy}{dx} = \sqrt{x+3}}$