

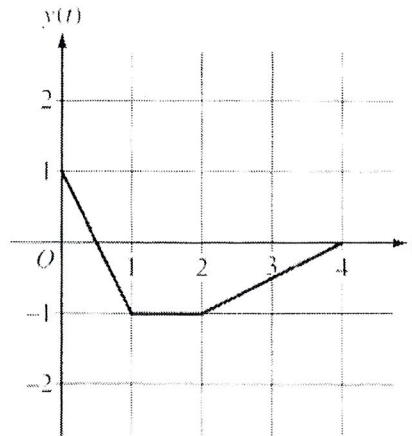
2. For time $t \geq 0$, a particle moves in the xy -plane with position $(x(t), y(t))$ and velocity vector

$$\left\langle (t-1)e^{t^2}, \sin(t^{1.25}) \right\rangle. \text{ At time } t = 0, \text{ the position of the particle is } (-2, 5).$$

- (a) Find the speed of the particle at time $t = 1.2$. Find the acceleration vector of the particle at time $t = 1.2$.
- (b) Find the total distance traveled by the particle over the time interval $0 \leq t \leq 1.2$.
- (c) Find the coordinates of the point at which the particle is farthest to the left for $t \geq 0$. Explain why there is no point at which the particle is farthest to the right for $t \geq 0$.

Write your responses to this question only on the designated pages in the separate Free Response booklet. Write your solution to each part in the space provided for that part.

2016 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS



2. At time t , the position of a particle moving in the xy -plane is given by the parametric functions $(x(t), y(t))$, where $\frac{dx}{dt} = t^2 + \sin(3t^2)$. The graph of y , consisting of three line segments, is shown in the figure above. At $t = 0$, the particle is at position $(5, 1)$.
- (a) Find the position of the particle at $t = 3$.
 - (b) Find the slope of the line tangent to the path of the particle at $t = 3$.
 - (c) Find the speed of the particle at $t = 3$.
 - (d) Find the total distance traveled by the particle from $t = 0$ to $t = 2$.
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END OF PART A OF SECTION II

2015 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS

2. At time $t \geq 0$, a particle moving along a curve in the xy -plane has position $(x(t), y(t))$ with velocity vector $v(t) = (\cos(t^2), e^{0.5t})$. At $t = 1$, the particle is at the point $(3, 5)$.
- (a) Find the x -coordinate of the position of the particle at time $t = 2$.
 - (b) For $0 < t < 1$, there is a point on the curve at which the line tangent to the curve has a slope of 2.
At what time is the object at that point?
 - (c) Find the time at which the speed of the particle is 3.
 - (d) Find the total distance traveled by the particle from time $t = 0$ to time $t = 1$.
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END OF PART A OF SECTION II

2012 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS

2. For $t \geq 0$, a particle is moving along a curve so that its position at time t is $(x(t), y(t))$. At time $t = 2$, the particle is at position $(1, 5)$. It is known that $\frac{dx}{dt} = \frac{\sqrt{t+2}}{e^t}$ and $\frac{dy}{dt} = \sin^2 t$.
- (a) Is the horizontal movement of the particle to the left or to the right at time $t = 2$? Explain your answer. Find the slope of the path of the particle at time $t = 2$.
- (b) Find the x -coordinate of the particle's position at time $t = 4$.
- (c) Find the speed of the particle at time $t = 4$. Find the acceleration vector of the particle at time $t = 4$.
- (d) Find the distance traveled by the particle from time $t = 2$ to $t = 4$.
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END OF PART A OF SECTION II

2011 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS

CALCULUS BC
SECTION II, Part A

Time—30 minutes

Number of problems—2

A graphing calculator is required for these problems.

1. At time t , a particle moving in the xy -plane is at position $(x(t), y(t))$, where $x(t)$ and $y(t)$ are not explicitly given. For $t \geq 0$, $\frac{dx}{dt} = 4t + 1$ and $\frac{dy}{dt} = \sin(t^2)$. At time $t = 0$, $x(0) = 0$ and $y(0) = -4$.
- (a) Find the speed of the particle at time $t = 3$, and find the acceleration vector of the particle at time $t = 3$.
 - (b) Find the slope of the line tangent to the path of the particle at time $t = 3$.
 - (c) Find the position of the particle at time $t = 3$.
 - (d) Find the total distance traveled by the particle over the time interval $0 \leq t \leq 3$.

WRITE ALL WORK IN THE EXAM BOOKLET.