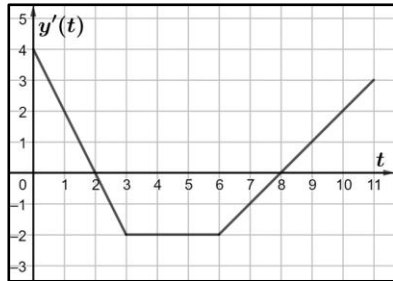


Calculus BC - 2021 AP Live Review Session 3

Everything You Need to Know About Parametrics



t	0	2	5	7	11
$x'(t)$	1	6	0	3	-2

1. At time t , the position of a particle moving in the xy -plane is given by the parametric functions $(x(t), y(t))$. Selected values of $x'(t)$ are shown in the table above. The graph of $y'(t)$, shown above, consists of three line segments. At time $t = 0$, the particle is at position $(4, -2)$.
- a) For $0 \leq t \leq 11$, it is known that the particle is at rest exactly once. At what time t is the particle at rest? Give a reason for your answer.
- b) Find the slope of the line tangent to the path of the particle at time $t = 7$.
- c) Using a left Riemann sum with the four subintervals indicated in the table above, approximate the x coordinate of the particle at time $t = 11$.
- d) Find the speed of the particle at time $t = 7$. Describe the direction of motion of the particle at time $t = 7$.
- e) Find the average velocity of the particle in the vertical direction on the interval $0 \leq t \leq 11$.



2. For $t \geq 0$, a particle is moving along a curve so that its position at time t is $(x(t), y(t))$. It is known that $\frac{dx}{dt} = t - 21 \sin(2^{0.34t})$ and $y(t) = 13 - 1.8 \ln(2.7t^2 - 1.5t + 2) + 2.4t \cos(0.5x)$. At time $t = 3$, the particle is at position $(-3, 1)$.

a) Find the speed of the particle at time $t = 2$.

b) Find the position of the particle at time $t = 8$.

c) Find the distance the particle travels from time $t = 0$ to $t = 1$.

d) For $0 \leq t \leq 8$, at what time t is the particle furthest to the right? Justify your answer.

5 for 5: MC Practice for Parametrics

1. The position of a particle moving in the xy -plane is given by the parametric equations $(x(t), y(t))$ where $\frac{dx}{dt} = 3t^3 - 6t^2$ and $\frac{dy}{dt} = t^2 - 10t + 16$. At which of the following times is the particle at rest?

(A) $t = \frac{4}{3}$

(B) $t = 2$

(C) $t = 5$

(D) $t = 8$

2. For $t \geq 0$, a particle moves in the xy -plane. The velocity vector for the particle is given by $v(t) = \langle e^{3t}, \cos(t^2) \rangle$. Which of the following gives the acceleration vector of the particle at time $t = 4$?

(A) $\langle e^{12}, \cos(16) \rangle$

(B) $\langle 3e^{12}, 8\cos(16) \rangle$

(C) $\langle e^{12}, -\sin(16) \rangle$

(D) $\langle 3e^{12}, -8\sin(16) \rangle$

3. The position of a particle moving in a plane is given by $x(t) = t^2 - 2t - 15$ and $y(t) = 3t^2 - 12t$. At what time t , is the line tangent to the path of the particle vertical?

(A) $t = 1$

(B) $t = 2$

(C) $t = 5$

(D) $t = 6$

4. An object moves in the xy -plane so that its position at time t is given by $(x(t), y(t))$, where $\frac{dx}{dt} = \ln(t^2 - t + 2)$ and $y(t) = -\frac{3}{e^{2t}}$. Which of the following correctly describes the direction of motion of the object when $t = 1$?
- (A) up and to the left
 - (B) up and to the right
 - (C) down and to the left
 - (D) down and to the right



5. For $t \geq 0$, the position of a particle moving along a curve in the xy -plane is defined by the parametric equations $x(t) = 1.53 \cos^2(t^3 - 4t)$ and $y(t) = -\frac{14t}{t^2 + 5}$. Which of the following gives the position of particle the first time the speed of the particle is 7?
- (A) (1.371, 3.103) (B) (0.681, 1.815) (C) (0.256, -3.071) (D) (3.819, -0.211)