

AP Calculus AB - Rates of Change in Context and Straight-Line Motion - Test

Common Core AP CALC AB 4.1, AP CALC AB 4.2, AP CALC AB 4.3 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

This test checks interpreting derivatives in context, and straight-line motion with position, velocity, acceleration and speed (AP Calculus AB, 4.1, 4.2, 4.3). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

About this test

- Grade: AP Calculus AB
- Chapter: Rates of Change in Context and Straight-Line Motion
- Standards: AP CALC AB 4.1, AP CALC AB 4.2, AP CALC AB 4.3
- Time: 45 minutes
- Total: 20 points

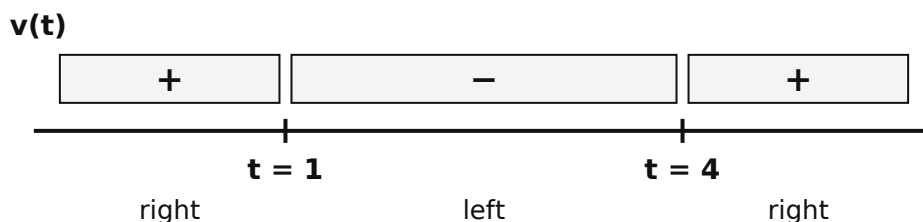
Question 1 - Interpreting derivatives [2 pts]

(a) The height of a plant in cm is $H(t)$ after t days, and $H'(8) = 1.5$. Interpret. (1 point) (b) The price of a share in dollars is $p(t)$ after t months and $p'(6) = -2.3$. Interpret. (1 point)

Question 2 - Position, velocity, acceleration [3 pts]

A skater's position in meters is $s(t) = t^3 - 12t + 4$ for $t \geq 0$ seconds. (a) Find $v(t)$ and $a(t)$. (1 point) (b) When is the skater at rest? (1 point) (c) Find a at that time. (1 point)

Question 3 - Direction from a sign chart [3 pts]



Sign chart for the velocity of a particle.

The sign chart shows the velocity $v(t) = (t-1)(t-4)$ of a particle, $t \geq 0$. (a) When does the particle change direction? (1 point) (b) On which intervals does it move left? (1 point) (c) If $a(t) = 2t-5$, is it speeding up or slowing down at $t = 2$? (1 point)

Question 4 - Geometric rates [2 pts]

(a) Find the rate of change of the area of a circle with respect to its radius when $r = 8$ cm. (1 point) (b) The volume of a sphere is $V(r) = \frac{4}{3}\pi r^3$. Find $V'(3)$. (1 point)

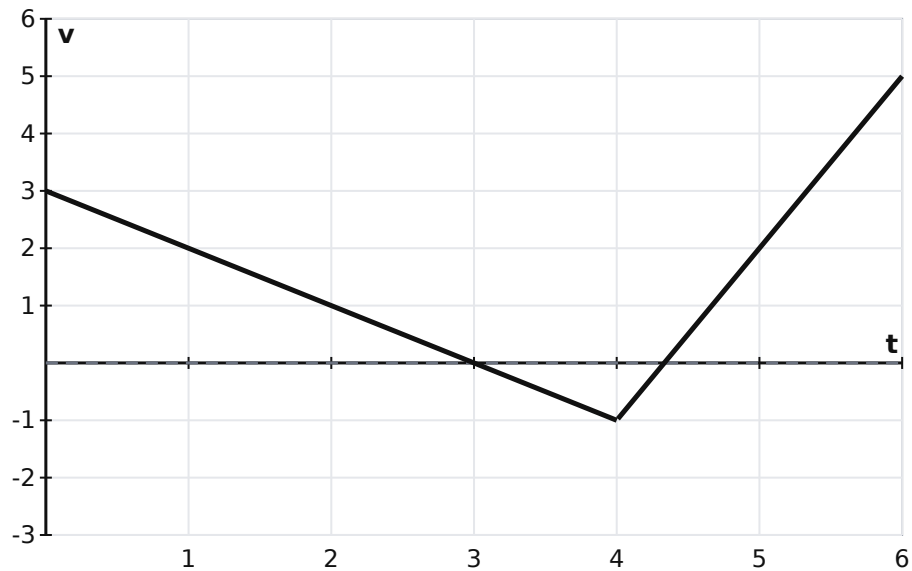
Question 5 - Velocity from a table [3 pts]

t (s)	0	2	4	6
s (m)	0	12	40	84

Position of a sled.

Use the table. (a) Find the average velocity on $[0,6]$. (1 point) (b) Estimate the velocity at $t = 4$ using the interval $[2,6]$. (1 point) (c) Is the sled speeding up? Explain using average velocities on $[0,2]$, $[2,4]$ and $[4,6]$. (1 point)

Question 6 - Reading a velocity graph [3 pts]



Velocity in feet per second.

The graph shows $v(t)$. (a) When is the particle at rest on $(0,6)$? (1 point) (b) On which interval is it slowing down? (1 point) (c) Find the acceleration on $4 < t < 6$. (1 point)

Question 7 - Exponential rate [2 pts]

A pond has $N(t) = 50e^{0.4t}$ algae cells (in thousands) after t days. Find $N'(3)$ and interpret it.

Question 8 - Total distance [2 pts]

A robot's position in feet is $s(t) = t^3 - 9t^2 + 24t$. Find the total distance traveled from $t = 0$ to $t = 5$ seconds.