

Derivatives with a Calculator

Objective: Use calculator strategies to evaluate derivatives.

$$\lim_{x \rightarrow 0} \frac{7x - \sin x}{x^2 + \sin(3x)} =$$

- (A) 6
- (B) 2
- (C) 1
- (D) 0

From the College Board Course Description:

Calculator Use on the Exams

Both the multiple-choice and free-response sections of the AP Calculus Exams include problems that require the use of a graphing calculator. A graphing calculator appropriate for use on the exams is expected to have the built-in capability to do the following:

1. Plot the graph of a function within an arbitrary viewing window
2. Find the zeros of functions (solve equations numerically)
3. Numerically calculate the derivative of a function
4. Numerically calculate the value of a definite integral

Math Print	Classic Print
“MATH” “8” from homescreen	“MATH” “8” from homescreen
$f'(c) = \frac{d}{dx}(f(x))\Big _{x=c}$	$f'(c) = \text{nDeriv}(f(x), x, c)$
Graph: $Y_1 = \frac{d}{dx}(f(x))\Big _{x=x}$	Graph: $Y_1 = \text{nDeriv}(f(x), x, x)$

A particle moves along the x -axis so that at any time $t \geq 0$, its velocity is given by $v(t) = 3 + 4.1 \cos(0.9t)$. What is the acceleration of the particle at time $t = 4$?

- (A) -2.016 (B) -0.677 (C) 1.633 (D) 1.814 (E) 2.978

For time $t \geq 0$, the velocity of a particle moving along the x -axis is given by $v(t) = (t-5)(t-2)^2$. At what values of t is the acceleration of the particle equal to 0?

- (A) 2 only
(B) 4 only
(C) 2 and 4
(D) 2 and 5

The second derivative of a function g is given by $g''(x) = 2^{-x^2} + \cos x + x$. For $-5 < x < 5$, on what open intervals is the graph of g concave up?

- (A) $-5 < x < -1.016$ only
(B) $-1.016 < x < 5$ only
(C) $0.463 < x < 2.100$ only
(D) $-5 < x < 0.463$ and $2.100 < x < 5$

The temperature, in degrees Fahrenheit ($^{\circ}\text{F}$), of water in a pond is modeled by the function H given by $H(t) = 55 - 9 \cos\left(\frac{2\pi}{365}(t+10)\right)$, where t is the number of days since January 1 ($t = 0$). What is the instantaneous rate of change of the temperature of the water at time $t = 90$ days?

- (A) $0.114^{\circ}\text{F/day}$
(B) $0.153^{\circ}\text{F/day}$
(C) $50.252^{\circ}\text{F/day}$
(D) $56.350^{\circ}\text{F/day}$