

Derivatives

1969
AB 11

The point on the curve $x^2 + 2y = 0$ that is nearest the point $\left(0, -\frac{1}{2}\right)$ occurs where y is

- (A) $\frac{1}{2}$ (B) 0 (C) $-\frac{1}{2}$ (D) -1 (E) none of the above

If $f(x) = 2 + |x - 3|$ for all x , then the value of the derivative $f'(x)$ at $x = 3$ is

- (A) -1 (B) 0 (C) 1 (D) 2 (E) nonexistent

1969
AB 45

If $\frac{d}{dx}(f(x)) = g(x)$ and $\frac{d}{dx}(g(x)) = f(x^2)$, then $\frac{d^2}{dx^2}(f(x^3)) =$

- (A) $f(x^6)$ (B) $g(x^3)$ (C) $3x^2g(x^3)$
(D) $9x^4f(x^6) + 6xg(x^3)$ (E) $f(x^6) + g(x^3)$

1973
AB4

If $f(x) = x + \sin x$, then $f'(x) =$

- (A) $1 + \cos x$ (B) $1 - \cos x$ (C) $\cos x$
(D) $\sin x - x \cos x$ (E) $\sin x + x \cos x$

1973
AB6

6. If $f(x) = \frac{x-1}{x+1}$ for all $x \neq -1$, then $f'(1) =$

- (A) -1 (B) $-\frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$ (E) 1

1973
AB9

If $y = \cos^2 3x$, then $\frac{dy}{dx} =$

- (A) $-6 \sin 3x \cos 3x$ (B) $-2 \cos 3x$ (C) $2 \cos 3x$
(D) $6 \cos 3x$ (E) $2 \sin 3x \cos 3x$

1973
AB11

If the line $3x - 4y = 0$ is tangent in the first quadrant to the curve $y = x^3 + k$, then k is

- (A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 0 (D) $-\frac{1}{8}$ (E) $-\frac{1}{2}$

1985
AB3

If $y = \frac{3}{4+x^2}$, then $\frac{dy}{dx} =$

- (A) $\frac{-6x}{(4+x^2)^2}$ (B) $\frac{3x}{(4+x^2)^2}$ (C) $\frac{6x}{(4+x^2)^2}$ (D) $\frac{-3}{(4+x^2)^2}$ (E) $\frac{3}{2x}$

1985
AB6

If $f(x) = x$, then $f'(5) =$

- (A) 0 (B) $\frac{1}{5}$ (C) 1 (D) 5 (E) $\frac{25}{2}$

1985
AB18

If $y = \cos^2 x - \sin^2 x$, then $y' =$

- (A) -1 (B) 0 (C) $-2\sin(2x)$ (D) $-2(\cos x + \sin x)$ (E) $2(\cos x - \sin x)$

1985
AB23

$\frac{d}{dx} \left(\frac{1}{x^3} - \frac{1}{x} + x^2 \right)$ at $x = -1$ is

- (A) -6 (B) -4 (C) 0 (D) 2 (E) 6

1988
ABU

An equation of the line tangent to the graph of $f(x) = x(1-2x)^3$ at the point $(1, -1)$ is

(A) $y = -7x + 6$

(B) $y = -6x + 5$

(C) $y = -2x + 1$

(D) $y = 2x - 3$

(E) $y = 7x - 8$

1988
AB12

If $f(x) = \sin x$, then $f'\left(\frac{\pi}{3}\right) =$

(A) $-\frac{1}{2}$

(B) $\frac{1}{2}$

(C) $\frac{\sqrt{2}}{2}$

(D) $\frac{\sqrt{3}}{2}$

(E) $\sqrt{3}$

1988
AB15

If $f(x) = \sqrt{2x}$, then $f'(2) =$

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

(C) $\frac{\sqrt{2}}{2}$

(D) 1

(E) $\sqrt{2}$

1988
AB18

If $y = 2 \cos\left(\frac{x}{2}\right)$, then $\frac{d^2y}{dx^2} =$

(A) $-8 \cos\left(\frac{x}{2}\right)$

(B) $-2 \cos\left(\frac{x}{2}\right)$

(C) $-\sin\left(\frac{x}{2}\right)$

(D) $-\cos\left(\frac{x}{2}\right)$

(E) $-\frac{1}{2} \cos\left(\frac{x}{2}\right)$

1993
AB 1

If $f(x) = x^{\frac{3}{2}}$, then $f'(4) =$

(A) -6

(B) -3

(C) 3

(D) 6

(E) 8

1993
AB 7

An equation of the line tangent to the graph of $y = \frac{2x+3}{3x-2}$ at the point (1,5) is

(A) $13x - y = 8$

(B) $13x + y = 18$

(C) $x - 13y = 64$

(D) $x + 13y = 66$

(E) $-2x + 3y = 13$

1993
AB 8

If $y = \tan x - \cot x$, then $\frac{dy}{dx} =$

(A) $\sec x \csc x$ (B) $\sec x - \csc x$ (C) $\sec x + \csc x$ (D) $\sec^2 x - \csc^2 x$ (E) $\sec^2 x + \csc^2 x$

1993
AB 24

If $f(x) = (x^2 - 2x - 1)^{\frac{2}{3}}$, then $f'(0)$ is

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

(B) 0

(C) $-\frac{2}{3}$

(D) $-\frac{4}{3}$

(E) -2

1997
AB2

If $f(x) = x\sqrt{2x-3}$, then $f'(x) =$

(A) $\frac{3x-3}{\sqrt{2x-3}}$

(B) $\frac{x}{\sqrt{2x-3}}$

(C) $\frac{1}{\sqrt{2x-3}}$

(D) $\frac{-x+3}{\sqrt{2x-3}}$

(E) $\frac{5x-6}{2\sqrt{2x-3}}$

1997
AB4

If $f(x) = -x^3 + x + \frac{1}{x}$, then $f'(-1) =$

(A) 3

(B) 1

(C) -1

(D) -3

(E) -5

1997
AB4

$\frac{d}{dx} \cos^2(x^3) =$

(A) $6x^2 \sin(x^3) \cos(x^3)$

(B) $6x^2 \cos(x^3)$

(C) $\sin^2(x^3)$

(D) $-6x^2 \sin(x^3) \cos(x^3)$

(E) $-2 \sin(x^3) \cos(x^3)$

1997
AB12

At what point on the graph of $y = \frac{1}{2}x^2$ is the tangent line parallel to the line $2x - 4y = 3$?

- (A) $\left(\frac{1}{2}, -\frac{1}{2}\right)$ (B) $\left(\frac{1}{2}, \frac{1}{8}\right)$ (C) $\left(1, -\frac{1}{4}\right)$ (D) $\left(1, \frac{1}{2}\right)$ (E) $(2, 2)$

1998
AB8

Let f and g be differentiable functions with the following properties:

- (i) $g(x) > 0$ for all x
(ii) $f(0) = 1$

If $h(x) = f(x)g(x)$ and $h'(x) = f(x)g'(x)$, then $f(x) =$

- (A) $f'(x)$ (B) $g(x)$ (C) e^x (D) 0 (E) 1

1998
AB10

What is the instantaneous rate of change at $x = 2$ of the function f given by $f(x) = \frac{x^2 - 2}{x - 1}$?

- (A) -2 (B) $\frac{1}{6}$ (C) $\frac{1}{2}$ (D) 2 (E) 6

1998
AB 18

An equation of the line tangent to the graph of $y = x + \cos x$ at the point $(0, 1)$ is

- (A) $y = 2x + 1$ (B) $y = x + 1$ (C) $y = x$ (D) $y = x - 1$ (E) $y = 0$

1999
AB 28

If $f(x) = \tan(2x)$, then $f'\left(\frac{\pi}{6}\right) =$

- (A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) 4 (D) $4\sqrt{3}$ (E) 8

