Calculus: Derivatives

Power Rule, Product Rule, & Quotient Rule

Find the derivative of each function.

1) $f(x) = 3x^2 - 5x + 2$

$6x - 5$

2) $y = 5$

0

3) $y = (2x^3 + 7)(3x^4 - 1)$

$(2x^3+7)(12x^3) + (3x^4-1)(6x^2)$
$= 42x^6 + 84x^3 - 6x^2$

4) $y = \frac{x^4}{4-7x}$

$\frac{16x^3 - 21x^4}{(4-7x)^2}$

5) $y = \frac{1}{2}x^6 - \frac{2}{3}x^3$

$3x^5 - 2x^2$

6) $y = \frac{\sin x}{7x}$

$\frac{(7x)(\cos x) - (\sin x)(7)}{(7x)^2}$

7) $y = \frac{\sec x}{x}$

$\frac{x \cdot \sec x \tan x - \sec x}{x^2}$

8) $g(x) = -3x^{-\frac{1}{2}}$

$\frac{3}{2}x^{-3/2} = \frac{3}{2x^{3/2}}$

9) $f(x) = 2^x$

$2^x \cdot \ln 2$

10) $y = \frac{x^2}{4} - \sqrt[3]{x} + \frac{1}{\sqrt{x}}$

$\frac{1}{2}x - \frac{1}{3x^{2/3}} - \frac{1}{2x^{3/2}}$

11) $h(x) = 4x + \cos x$

$4 - \sin x$

12) $y = \frac{3x-5}{1-4x}$

$\frac{-17}{(1-4x)^2}$

13) $y = \frac{4x^{\frac{3}{2}}}{x}$

$\frac{2}{\sqrt{x}}$

14) $y = 2x - \sin x$

$2 - \cos x$

15) $f(x) = \frac{x^2-5x+6}{3x^2+4x-2}$

$\frac{(3x^2+4x-2)(2x-5) - (x^2-5x+6)(6x+4}{(3x^2+4x-2)^2}$

16) $y = \frac{x(x^2-1)}{x+3}$

$\frac{2x^3+9x^2-2x-3}{(x+3)^2}$

17) $g(x) = x^2 + 5x + 3 - \frac{1}{x^2}$

$2x + 5 + \frac{2}{x^3}$

18) $y = e^x(4x + 1)$

$5e^x + 4xe^x$

16

19) $y = \frac{2}{1+x}$

$\frac{-2}{(x+1)^2}$

20) $y = \frac{4}{5x^2}$

$\frac{-8}{5x^3}$

21) $y = -3x\cos x$

$3x\sin x - 3\cos x$

22) $y = \sin x \cos x$

$\cos(2x)$

23) $d(t) = (t^3 - 2)^2$

$6t^5 - 12t^2$

24) $f(x) = \frac{x^2-4}{x+2}$

1

25) $g(x) = x^4\left(1 - \frac{2}{x+1}\right)$

$(x^4)\left(\frac{2}{(x+1)^2}\right) + \left(1 - \frac{2}{x+1}\right)(4x^3)$

$= \frac{2x^4}{(x+1)^2} + 4x^3 - \frac{8x^3}{x+1}$

26) $y = 3x^{\frac{2}{3}} - 4x^{\frac{1}{2}} - 2$

$\frac{2}{x^{1/3}} - \frac{2}{x^{1/2}}$

27) $f(x) = \frac{1}{2}\csc x$

$-\frac{1}{2}\csc x \cot x$

28) $y = \frac{1+x^2}{1-x^2}$

$\frac{4x}{(1-x^2)^2}$

29) $f(x) = \frac{3x^4-2x^3+4}{2x^2}$

$3x - 1 - \frac{4}{x^3}$

30) $g(x) = \frac{x^{-1}+x^{-2}}{x^{-3}}$

$2x + 1$

31) $y = \sec x \tan x$

$\sec^3 x + \sec x \tan^2 x$

32) $y = 2\sin x - \tan x$

$2\cos x - \sec^2 x$

33) $f(x) = \frac{4}{\cos x}$

$4\sec x \tan x$

34) $y = \frac{1-\cos x}{\sin x}$

$\frac{1}{1+\cos x}$

35) $g(x) = 3^x + 5x$

$3^x \cdot \ln 3 + 5$

36) $y = x^2 \sin x + 2x \cos x$

$x^2\cos x + 2\cos x$