

General Power Differentiation Rule ... Set 3

Derivatives using Power Rule

Find the derivatives using power rule:

$$y = 10x^3$$

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

$$y = \frac{1}{2\sqrt{x}}$$

$$y = 3x^{\frac{-1}{15}}$$

$$y = 8x^6 + 2x^{17}$$

$$y = \sqrt[5]{x}$$

$$y = x^{\frac{1}{31}} + x^{\frac{-1}{7}}$$

$$y = 2x^{12} + 6x^7 + x^4$$

$$y = \frac{5}{3}x^3 - \frac{7}{6}x^6 + \frac{6}{4}x^8$$

$$y = \frac{1}{2}x^{\frac{3}{2}} - \frac{22}{7}x^{\frac{-5}{2}} + x^{\frac{3}{7}}$$

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Find the derivatives using power rule:

$$y = \frac{8x^5 + 4x^4}{2x^2}$$

$$y = \frac{15x^7 + 21x^5 + 12x^3}{3x}$$

$$y = \frac{-22x^{-5} - 17x^{-11}}{21x^{-4}}$$

$$y = \frac{2x^{\frac{11}{3}} + 4x^{\frac{5}{4}} - 3x^{\frac{7}{2}}}{4x^{\frac{2}{3}}}$$

$$y = \frac{7x^2 + 5x^9}{4x^7}$$

$$y = \frac{\sqrt{x} - \sqrt[3]{x}}{\sqrt[5]{x}}$$

$$y = \frac{5x^{-45} + 15x^{-4} - 5x^{-17}}{5x^{-2}}$$

$$y = \frac{5x^2 + 12x^{-5}}{\sqrt{x}}$$

$$y = \frac{\frac{2}{7}x^{\frac{-5}{11}} + \frac{16}{7}x^{\frac{-12}{11}}}{x^{\frac{-21}{11}}}$$

$$y = \frac{x^{\frac{7}{3}} + x^{\frac{10}{3}}}{\sqrt[3]{x}}$$

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Derivatives using Product Rule

Find the derivatives using product rule:

$$y = (x^2 + 1)(x + 1)^2$$

$$y = (x + 1)(\sqrt{x} + 2)$$

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

$$y = x(x^7 + 15)^3$$

$$y = x^2(x + 7)^3$$

$$y = x^7 \sqrt{4x^2 + 7}$$

$$y = \sqrt{x}(x^2 + 4)$$

$$y = (\sqrt{x^2 + 1})(\sqrt{x^2 - 1})$$

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

$$y = (\sqrt{x} - 1)(\sqrt{x} + 1)$$

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Derivatives using Quotient Rule

Find the derivatives using quotient rule:

$$y = \frac{x}{x+1}$$

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

$$y = \frac{4x^3 - 7x}{5x^2 + 2}$$

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

$$y = \frac{x^9 - 1}{\sqrt{x^2 - 1}}$$

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

$$y = \frac{x^3}{\sqrt{x} + 1}$$

$$y = \frac{x+1}{x-1}$$

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

$$y = \frac{\sqrt{x}}{x + \frac{7}{2}}$$

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Techniques of Differentiation

For the following functions, find $f'(x)$ and $f'(c)$ at the indicated value of c .

1) $f(x) = x^2 - 6x + 1$ $c = 0$ 2) $f(x) = \frac{1}{x} - \frac{3}{x^2} + \frac{4}{x^3}$ $c = 1$ 3) $f(x) = 3\sqrt{x} - \frac{1}{\sqrt[3]{x}}$ $c = 1$

For the following functions, find the derivative using the power rule.

4) $y = \frac{8}{3x^2}$

5) $y = \frac{-9}{(3x^2)^3}$

6) $y = \frac{6x^{3/2}}{x}$

7) $y = \frac{4x^2 - 5x + 6}{3}$

8) $y = \frac{x^2 - 6x + 2}{2x}$

9) $y = \frac{x^3 + 8}{x + 2}$

10) $y = x^4 - \frac{3}{2}x^3 + 5x^2 - 6x - 2$

11) $y = \frac{x^3 - 3x^2 + 10x - 5}{x^2}$

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

13) $y = (x - 2)^3$

14) $y = \sqrt[3]{x} - \sqrt[3]{x^2}$

15) $y = \frac{(x^2 - x + 2)^2}{x}$

For the following functions, find the derivatives.

16) $y = (x^2 - 4x - 6)(x^3 - 5x^2 - 3x)$ 17) $y = \frac{3x - 2}{2x + 3}$

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

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$$19) y = \frac{x-1}{\sqrt{x}}$$

$$20) y = \frac{x^2 - x + 1}{\sqrt[3]{x}}$$

$$21) y = \left(\frac{x-3}{x+4}\right)(3x-2)$$

$$22) y = \frac{x-1}{x^2 + 2x + 2}$$

$$23) y = \frac{x^2 + k^2}{x^2 - k^2}, k \text{ is a constant}$$

$$24) y = \frac{x^2 - k^2}{x^2 + k^2}, k \text{ a constant}$$

an equation of the tangent line to the graph of f at the indicated point and then use your calculator to confirm results.

$$25) f(x) = \frac{x^2}{x-1} \text{ at } (2, 4)$$

$$26) f(x) = (x-2)(x^2 - 3x - 1) \text{ at } (-1, -9)$$

$$27) f(x) = \frac{x^2 - 4x + 2}{2x - 1} \text{ at } \left(2, -\frac{2}{3}\right)$$

$$28) y = \left(\frac{x+3}{x+1}\right)(4x+1) \text{ at } \left(-\frac{1}{2}, -5\right)$$