

Review of product, quotient, power rules

Date _____ Period _____

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Differentiate each function with respect to x .

1) $y = \frac{4x^3}{2x^5 - 3}$

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

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

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

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

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

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

8) $y = \frac{2x^4 + 2x^3}{4x^5 + 5}$

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

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

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

12) $y = (-4x^4 - 2) \cdot 4x^5$

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

14) $y = -4x^2(-2x^5 - 5)$

15) $y = -2x^2(-2x^2 + 5)$

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

17) $y = (5x^3 - 4) \cdot 3x^4$

18) $y = x^3(-3x^3 + 3)$

19) $y = (3x^2 + 1) \cdot -5x^3$

20) $y = (-5x^2 + 5) \cdot 5x^4$

Differentiate each function with respect to x . Problems may contain constants a , b , and c .

21) $y = -5x^a$

22) $y = \frac{1}{5}x^5$

23) $y = \sqrt[5]{x^2}$

24) $y = -3x^{5b}$

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

26) $y = \frac{4}{5}\sqrt[3]{x}$

27) $y = -x^5$

28) $y = 5\sqrt[4]{x}$

29) $y = 2\sqrt[5]{x}$

30) $y = 3\sqrt[3]{x}$

Answers to Review of product, quotient, power rules

$$1) \frac{dy}{dx} = \frac{(2x^5 - 3) \cdot 12x^2 - 4x^3 \cdot 10x^4}{(2x^5 - 3)^2}$$

$$= \frac{-16x^7 - 36x^2}{4x^{10} - 12x^5 + 9}$$

$$2) \frac{dy}{dx} = -\frac{3x^2}{(x^3 - 5)^2}$$

$$= -\frac{3x^2}{x^6 - 10x^3 + 25}$$

$$3) \frac{dy}{dx} = \frac{(x^4 - 2) \cdot 12x^3 - 3x^4 \cdot 4x^3}{(x^4 - 2)^2}$$

$$= -\frac{24x^3}{x^8 - 4x^4 + 4}$$

$$4) \frac{dy}{dx} = -\frac{2 \cdot 3x^2}{(x^3 - 3)^2}$$

$$= -\frac{6x^2}{x^6 - 6x^3 + 9}$$

$$5) \frac{dy}{dx} = -\frac{3 \cdot 12x^2}{(4x^3 - 4)^2}$$

$$= -\frac{9x^2}{4x^6 - 8x^3 + 4}$$

$$6) \frac{dy}{dx} = \frac{(2x^3 + 5)(25x^4 + 8x) - (5x^5 + 4x^2) \cdot 6x^2}{(2x^3 + 5)^2}$$

$$= \frac{20x^7 + 117x^4 + 40x}{4x^6 + 20x^3 + 25}$$

$$7) \frac{dy}{dx} = \frac{(5x^4 - 4) \cdot 8x - (4x^2 + 3) \cdot 20x^3}{(5x^4 - 4)^2}$$

$$= \frac{-40x^5 - 60x^3 - 32x}{25x^8 - 40x^4 + 16}$$

$$8) \frac{dy}{dx} = \frac{(4x^5 + 5)(8x^3 + 6x^2) - (2x^4 + 2x^3) \cdot 20x^4}{(4x^5 + 5)^2}$$

$$= \frac{-8x^8 - 16x^7 + 40x^3 + 30x^2}{16x^{10} + 40x^5 + 25}$$

$$9) \frac{dy}{dx} = \frac{(x^2 - 5) \cdot 6x^2 - (2x^3 - 5) \cdot 2x}{(x^2 - 5)^2}$$

$$= \frac{2x^4 - 30x^2 + 10x}{x^4 - 10x^2 + 25}$$

$$10) \frac{dy}{dx} = \frac{(3x^3 + 4)(10x^4 - 4x^3) - (2x^5 - x^4) \cdot 9x^2}{(3x^3 + 4)^2}$$

$$= \frac{12x^7 - 3x^6 + 40x^4 - 16x^3}{9x^6 + 24x^3 + 16}$$

$$11) \frac{dy}{dx} = 2x^3 \cdot -6x^2 + (-2x^3 + 4) \cdot 6x^2$$

$$= -24x^5 + 24x^2$$

$$12) \frac{dy}{dx} = (-4x^4 - 2) \cdot 20x^4 + 4x^5 \cdot -16x^3$$

$$= -144x^8 - 40x^4$$

$$13) \frac{dy}{dx} = -3x^3 \cdot -6x + (-3x^2 + 2) \cdot -9x^2$$

$$= 45x^4 - 18x^2$$

$$14) \frac{dy}{dx} = -4x^2 \cdot -10x^4 + (-2x^5 - 5) \cdot -8x$$

$$= 56x^6 + 40x$$

$$15) \frac{dy}{dx} = -2x^2 \cdot -4x + (-2x^2 + 5) \cdot -4x$$

$$= 16x^3 - 20x$$

$$16) \frac{dy}{dx} = -2x^3 \cdot -4x + (-2x^2 + 4) \cdot -6x^2$$

$$= 20x^4 - 24x^2$$

$$17) \frac{dy}{dx} = (5x^3 - 4) \cdot 12x^3 + 3x^4 \cdot 15x^2$$

$$= 105x^6 - 48x^3$$

$$18) \frac{dy}{dx} = x^3 \cdot -9x^2 + (-3x^3 + 3) \cdot 3x^2$$

$$= -18x^5 + 9x^2$$

$$19) \frac{dy}{dx} = (3x^2 + 1) \cdot -15x^2 - 5x^3 \cdot 6x$$

$$= -75x^4 - 15x^2$$

$$20) \frac{dy}{dx} = (-5x^2 + 5) \cdot 20x^3 + 5x^4 \cdot -10x$$

$$= -150x^5 + 100x^3$$

$$21) \frac{dy}{dx} = -5ax^{a-1}$$

$$22) \frac{dy}{dx} = x^4$$

$$23) \frac{dy}{dx} = \frac{2}{5x^{\frac{3}{5}}}$$

$$24) \frac{dy}{dx} = -15bx^{5b-1}$$

$$25) \frac{dy}{dx} = -\frac{1}{3x^{\frac{1}{3}}}$$

$$26) \frac{dy}{dx} = \frac{4}{15x^{\frac{2}{3}}}$$

$$27) \frac{dy}{dx} = -5x^4$$

$$28) \frac{dy}{dx} = \frac{5}{4x^{\frac{3}{4}}}$$

$$29) \frac{dy}{dx} = \frac{2}{5x^{\frac{4}{5}}}$$

$$30) \frac{dy}{dx} = \frac{1}{x^{\frac{2}{3}}}$$