Calculus

Name_____ ID: 1

Assignment

Date_____ Period____

Differentiate each function with respect to x.

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

2) $y = (5x^5 + 3) \cdot 4x^2$

3) $y = (x^5 + 4)(5x^2 - 1)$

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

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

6) $y = \left(-5x^3 + \sqrt[5]{x^2} + 2\right)\left(2x^5 - 1\right)$

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

8) $y = \dfrac{1}{3x^4 + 3}$

9) $y = \dfrac{5x^4 + 2x^2}{3x^2 + 3}$

10) $y = \dfrac{4x^3 + 4}{3x^2 + 3}$

11) $y = \dfrac{x^5 + 2x^4}{2 - 4x^{-2}}$

12) $y = \dfrac{x^3 - 1}{4 + 5x^{-2}}$

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

$$\frac{dy}{dx} = (3x^2 + 3) \cdot 6x^2 + 2x^3 \cdot 6x$$
$$= 30x^4 + 18x^2$$

2) $y = (5x^5 + 3) \cdot 4x^2$

$$\frac{dy}{dx} = (5x^5 + 3) \cdot 8x + 4x^2 \cdot 25x^4$$
$$= 140x^6 + 24x$$

3) $y = (x^5 + 4)(5x^2 - 1)$

$$\frac{dy}{dx} = (x^5 + 4) \cdot 10x + (5x^2 - 1) \cdot 5x^4$$
$$= 35x^6 - 5x^4 + 40x$$

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

$$\frac{dy}{dx} = (-4x^5 + 5) \cdot -25x^4 + (-5x^5 + 2) \cdot -20x^4$$
$$= 200x^9 - 165x^4$$

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

$$\frac{dy}{dx} = \left(-2x^2 + x^{\frac{2}{3}} + 3\right) \cdot 4x^3 + (x^4 + 4)\left(-4x + \frac{2}{3}x^{-\frac{1}{3}}\right)$$
$$= -12x^5 + \frac{14x^{\frac{11}{3}}}{3} + 12x^3 - 16x + \frac{8}{3x^{\frac{1}{3}}}$$

6) $y=\left(-5x^3+\sqrt[5]{x^2}+2\right)\left(2x^5-1\right)$

$$\frac{dy}{dx}=\left(-5x^3+x^{\frac{2}{5}}+2\right)\cdot 10x^4+\left(2x^5-1\right)\left(-15x^2+\frac{2}{5}x^{-\frac{3}{5}}\right)$$

$$=-80x^7+\frac{54x^{\frac{22}{5}}}{5}+20x^4+15x^2-\frac{2}{5x^{\frac{3}{5}}}$$

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

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

$$=-\frac{40x^4}{16x^{10}-24x^5+9}$$

8) $y=\dfrac{1}{3x^4+3}$

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

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

9) $y=\dfrac{5x^4+2x^2}{3x^2+3}$

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

$$=\frac{10x^5+20x^3+4x}{3x^4+6x^2+3}$$

10) $y=\dfrac{4x^3+4}{3x^2+3}$

$$\frac{dy}{dx}=\frac{\left(3x^2+3\right)\cdot 12x^2-\left(4x^3+4\right)\cdot 6x}{\left(3x^2+3\right)^2}$$

$$=\frac{4x^4+12x^2-8x}{3x^4+6x^2+3}$$

11) $y=\dfrac{x^5+2x^4}{2-4x^{-2}}$

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

$$=\frac{5x^8+8x^7-14x^6-24x^5}{2x^4-8x^2+8}$$

12) $y=\dfrac{x^3-1}{4+5x^{-2}}$

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

$$=\frac{12x^6+25x^4-10x}{16x^4+40x^2+25}$$