$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{gf' - fg'}{g^2}$$

Name__ Key

Differentiation - Quotient Rule

Date_____ Period____

Differentiate each function with respect to x.

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

$$y' = \frac{(2x^4 - 5)(0) - (2)(8x^3)}{(2x^4 - 5)^2}$$

$$\boxed{y' = -\frac{16x^3}{(2x^4 - 5)^2}}$$

2) $f(x) = \dfrac{2}{x^5 - 5}$

$$f' = \frac{(x^5 - 5)(0) - (2)(5x^4)}{(x^5 - 5)^2}$$

$$\boxed{f' = \frac{-10x^4}{(x^5 - 5)^2}}$$

3) $f(x) = \dfrac{5}{4x^3 + 4}$

$$\frac{df}{dx} = \frac{(4x^3 + 4)(0) - (5)(12x^2)}{(4x^3 + 4)^2}$$

$$\boxed{\frac{df}{dx} = -\frac{60x^2}{(4x^3 + 4)^2}}$$

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

$$\boxed{\frac{dy}{dx} = \frac{(4x^5 - 4)(12x^2 - 6x) - (4x^3 - 3x^2)(20x^4)}{(4x^5 - 4)^2}}$$

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

$$\boxed{\frac{dy}{dx} = \frac{(3x^3 - 2)(12x^3) - (3x^4 + 2)(9x^2)}{(3x^3 - 2)^2}}$$

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

$$\boxed{y' = \frac{(3x^4 + 5)(20x^4 + 4x) - (4x^5 + 2x^2)(12x^3)}{(3x^4 + 5)^2}}$$

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

$$\boxed{y' = \frac{(5x^2 - 2)(20x^4 + 2x) - (4x^5 + x^2 + 4)(10x)}{(5x^2 - 2)^2}}$$

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

$$\boxed{y' = \frac{(2x^4 - 4)(12x^3 + 15x^2) - (3x^4 + 5x^3 - 5)(8x^3)}{(2x^4 - 4)^2}}$$

$$\frac{d}{dx}(fg) = gf' + fg'$$

Name___Key___

Differentiation - Product Rule

Date_____ Period_____

Differentiate each function with respect to x.

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

$$y' = (3x^4 - 2)(-3x^2) + (-x^3)(12x^3)$$

2) $f(x) = x^2(-3x^2 - 2)$

$$f' = (-3x^2 - 2)(2x) + (x^2)(-6x)$$

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

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

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

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

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

$$f' = (-2x^5 - 3)(25x^4) + (5x^5 + 5)(-10x^4)$$

6) $f(x) = (-3 + x^{-3})(-4x^3 + 3)$

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

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

$$\frac{dy}{dx} = (-3x^2 + 2)(-8x^3 + 10x) + (-2x^4 + 5x^2 + 4)(-6x)$$

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

$$y' = (-4x^5 + 5x^4 + 5)(4x^3) + (x^4 + 3)(-20x^4 + 20x^3)$$

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