

Key

Math 4

5-8 - 5-10 Practice

Name _____

Date _____

Prac

1. $f(x) = x^2(2x+5)$

$$\begin{aligned} f'(x) &= x^2(2) + (2x+5)(2x) \\ &= 2x^2 + 4x^2 + 10x \\ &= \boxed{6x^2 + 10x} \end{aligned}$$

Chain

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

$$\begin{aligned} f'(x) &= 3(2x-3)^2(2) \\ &= \boxed{6(2x-3)^2} \end{aligned}$$

Quo

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

$$\begin{aligned} \frac{dy}{dx} &= \frac{(x^2+1)(2) - (2x-1)(2x)}{(x^2+1)^2} \\ &= \frac{2x^2+2-4x^2+2x}{(x^2+1)^2} \\ &= \boxed{\frac{-2x^2+2x+2}{(x^2+1)^2}} \end{aligned}$$

Prac

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

$$\begin{aligned} \frac{dy}{dx} &= (3x^2-2x+1)(2) + (2x-1)(6x-2) \\ &= 6x^2-4x+2 + 12x^2-4x-6x+2 \\ &= \boxed{18x^2-14x+4} \end{aligned}$$

Chain

2. $g(x) = (2x^2+3x-2)^2$

$$\begin{aligned} g'(x) &= 2(2x^2+3x-2)(4x+3) \\ &= \boxed{(8x+6)(2x^2+3x-2)} \end{aligned}$$

Quo

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

$$\begin{aligned} \frac{dy}{dx} &= \frac{(x-1)(2x) - x^2(1)}{(x-1)^2} \\ &= \frac{2x^2-2x-x^2}{(x-1)^2} \\ &= \boxed{\frac{x^2-2x}{(x-1)^2}} \end{aligned}$$

Chain

6. $y = (1+x^2)^{\frac{1}{2}}$

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{2}(1+x^2)^{-\frac{1}{2}}(2x) \\ &= \boxed{\frac{x}{(1+x^2)^{\frac{1}{2}}} \text{ or } \frac{x}{\sqrt{1+x^2}}} \end{aligned}$$

Chain

8. $y = \sqrt{2x-1} = (2x-1)^{\frac{1}{2}}$

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{2}(2x-1)^{-\frac{1}{2}}(2) \\ &= \boxed{\frac{1}{(2x-1)^{\frac{1}{2}}} \text{ or } \frac{1}{\sqrt{2x-1}}} \end{aligned}$$

Chain

9. $f(x) = (3-4x)^4$

$$f'(x) = 4(3-4x)^3(-4)$$

$$= -16(3-4x)^3$$

Prod + chain

10. $y = (x-1)^3 \sqrt{x^2+1}$

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

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

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

Prod + chain

11. $y = (x+1)^2(x^2+1)^{-3}$

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

$$= \frac{-6x(x+1)^2}{(x^2+1)^4} + \frac{2(x+1)}{(x^2+1)^3}$$

Chain + Quo

12. $y = \left(\frac{x+1}{x-1}\right)^2$

$$\frac{dy}{dx} = 2\left(\frac{x+1}{x-1}\right) \left[\frac{(x-1)(1) - (x+1)(1)}{(x-1)^2} \right]$$

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

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

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