Worksheet - Combining Differentiation Rules

Differentiate using a combination of derivative rules

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

2. $g(x) = \left(\dfrac{1 + x^2}{1 - x^2}\right)^{10}$

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

4. $y = (x^2 + 3)^3 (x^3 + 3)^2$

5. $y = \dfrac{3x^2 + 2x}{x^2 + 1}$

6. $h(x) = x^3 (3x - 5)^2$

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

8. $y = \left(\dfrac{x^2 - 3}{x^2 + 3}\right)^4$

9. $y = x^4 (2x - 5)^6$

10. $y = x\sqrt{x^2 + 1}$

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

12. $y = \left(\dfrac{10x - 1}{3x + 5}\right)^6$

13. $y = (x - 2)^3 (x^2 + 9)^4$

14. $y = (1 - x^2)^3 (6 + 2x)^{-3}$

15. $y = \dfrac{6x - 1}{(3x + 5)^4}$

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

17. $f(x) = \dfrac{-3x^4}{\sqrt{4x - 8}}$

18. $g(x) = \left(\dfrac{2x + 5}{6 - x^2}\right)^4$

19. $y = \left[\dfrac{1}{(4x + x^2)^3}\right]^3$

Answers

1. $h'(x) = 4(x^2 + 3)^3 (4x - 5)^2 (11x^2 - 10x + 9)$ **2.** $g'(x) = \dfrac{40x(1 + x^2)^9}{(1 - x^2)^{11}}$

3. $f'(x) = (x + 4)^2 (x - 3)^5 (9x + 15)$ **4.** $y' = 6x(x^2 + 3)^2 (x^3 + 3)(2x^3 + 3x + 3)$ **5.** $y' = \dfrac{-2(x^2 - 3x - 1)}{(x^2 + 1)^2}$

6. $h'(x) = 15x^2 (3x - 5)(x - 1)$ **7.** $y' = 4x^3 (1 - 4x^2)^2 (1 - 10x^2)$ **8.** $y' = \dfrac{48x(x^2 - 3)^3}{(x^2 + 3)^5}$

9. $y' = 20x^3 (2x - 5)^5 (x - 1)$ **10.** $y' = \dfrac{x^2}{\sqrt{x^2 + 1}} + \sqrt{x^2 + 1} = \dfrac{2x^2 + 1}{\sqrt{x^2 + 1}}$ **11.** $y' = \dfrac{(2x - 5)^3 (2x + 23)}{(x + 1)^4}$

12. $y' = \dfrac{318(10x - 1)^5}{(3x + 5)^7}$ **13.** $y' = (x - 2)^2 (x^2 + 9)^3 (11x^2 - 16x + 27)$ **14.** $y' = \dfrac{-3(1 - x^2)^2 (x^2 + 6x + 1)}{8(x + 3)^4}$

15. $y' = \dfrac{6(-9x + 7)}{(3x + 5)^5}$ **16.** $y' = \dfrac{2(2x^2 - 5)^2 (4x^2 + 48x + 5)}{(x + 8)^3}$ **17.** $f'(x) = \dfrac{-6x^3 (7x - 16)}{(4x - 8)^{3/2}}$

18. $g'(x) = 8\left(\dfrac{2x + 5}{6 - x^2}\right)^3 \left(\dfrac{(x + 2)(x + 3)}{(6 - x^2)^2}\right)$ **19.** $y' = \dfrac{-18(2 + x)}{(4x + x^2)^{10}}$

$$= \dfrac{8(2x + 5)^3 (x + 2)(x + 3)}{(6 - x^2)^5}$$