ILLAWARRA TUTORING

In this worksheet you will practise applying the power, sum, and constant multiple rules to differentiate functions with ease. Work through each question carefully and show your working where appropriate.

Easy Questions

1. Differentiate the function $f(x) = 3x^4$.
2. Differentiate $f(x) = 7x^3 + 5$.
3. Differentiate $f(x) = -2x^2 + 3x$.
4. Differentiate $f(x) = 6x^5 - 8x^3$.
5. Differentiate $f(x) = 10$.

Intermediate Questions

6. Differentiate $f(x) = 4x^3 + 9x^2 - x + 7$.
7. Differentiate $f(x) = 5x^4 - 2x^2 + 3x - 8$.
8. Differentiate $f(x) = -3x^5 + x^3 - 6$.
9. Differentiate $f(x) = \frac{1}{2}x^4 + 3x^2 - x$.
10. Differentiate $f(x) = 7x^2 - 4x + 9$.
11. Differentiate $f(x) = 8x^{\frac{3}{2}} + 2x^{\frac{1}{2}}$.
12. Differentiate $f(x) = 9x^{\frac{5}{2}} - 4x^{\frac{3}{2}} + x^{\frac{1}{2}}$.
13. Differentiate $f(x) = 10 - 2x^{\frac{2}{3}} + 3x$.
14. Differentiate $f(x) = -5x^{\frac{7}{2}} + 6x^3$.
15. Differentiate $f(x) = 2x^4 - x^3 + 4x^2 - x + 5$.
16. Differentiate $f(x) = x^6 - 4x^5 + 3x^4$.
17. Differentiate $f(x) = 7 - 3x + x^2 - 2x^3$.
18. Differentiate $f(x) = -2x^3 + 4x^2 - 6x$.

19. Differentiate $f(x) = \frac{1}{3}x^3 + \frac{1}{4}x^4$.

20. Differentiate $f(x) = 5x^{\frac{1}{3}} + 4x^{\frac{2}{3}}$.

Hard Questions

21. Differentiate $f(x) = \sqrt{x^4} + \sqrt[3]{x^6}$. (Hint: Rewrite using exponents before differentiating.)

22. Differentiate $f(x) = (2x^3)^2$. (Hint: Expand the power to rewrite the function in the form $f(x) = 4x^6$.)

23. Differentiate $f(x) = (3x)^4$. (Hint: Express the function as a constant times a power of x.)

24. Expand and differentiate $f(x) = (x + 2)^2$.

25. Expand and differentiate $f(x) = (2 - x)^3$.

26. Expand and differentiate $f(x) = (x - 3)^4$.

27. Expand and differentiate $f(x) = 2(x - 1)^2 + 3(x + 1)^2$.

28. Expand and differentiate $f(x) = (x^2 - 1)^2$.

29. Expand and differentiate $f(x) = (2x + 3)^3$.

30. Expand and differentiate $f(x) = -4(x - 2)^3 + 5(x + 3)^2$.