ILLAWARRA TUTORING

In this worksheet you will learn how to differentiate products of functions using the product rule. Recall that if $f(x) = u(x)v(x)$, then $f'(x) = u'(x)v(x) + u(x)v'(x)$. Work through each question carefully.

Easy Questions

1. Write down the functions $u(x)$ and $v(x)$ for $f(x) = (2x)(3x^2)$ and use the product rule to find $f'(x)$.
2. For $f(x) = (\sin x)(x^2)$, identify $u(x)$ and $v(x)$. Then differentiate using the product rule.
3. Differentiate $f(x) = (x+1)(x-1)$ using the product rule.
4. Differentiate $f(x) = (5)(x^3)$ using the product rule.
5. Differentiate $f(x) = (x^2)(x^2)$ using the product rule.

Intermediate Questions

6. Differentiate $f(x) = (x^2)(e^x)$ using the product rule.
7. Differentiate $f(x) = (\cos x)(x^3)$ using the product rule.
8. Differentiate $f(x) = (\ln x)(x)$ using the product rule.
9. Differentiate $f(x) = (\sqrt{x})(x^2)$ using the product rule.
10. Differentiate $f(x) = \left(\frac{1}{x}\right)(x^2)$ using the product rule.
11. Differentiate $f(x) = (2x+3)(x^2-1)$ and simplify your answer.
12. Differentiate $f(x) = (x-4)(x+2)$ using the product rule.
13. Differentiate $f(x) = (3x^2-1)(x^4+2)$ using the product rule.
14. Differentiate $f(x) = (x^2+1)(x^3-3)$ using the product rule and simplify.
15. Differentiate $f(x) = (\tan x)(x^2)$ using the product rule.
16. Differentiate $f(x) = (x^2)(\cos x)$ using the product rule.
17. Differentiate $f(x) = (x-2)(x^2+5x+6)$ using the product rule and simplify.

18. Differentiate $f(x) = (4x)(x^3)$ using the product rule.
19. Differentiate $f(x) = (\sin x)(\cos x)$ using the product rule.
20. Differentiate $f(x) = (e^x)(x)$ using the product rule.

Hard Questions

21. Differentiate $f(x) = (x^3 + 2x)(x^2 - 4)$ using the product rule and simplify your answer.
22. Differentiate $f(x) = (2x^2 - 3x + 1)(5x^2 + x - 2)$ using the product rule and simplify completely.
23. Differentiate $f(x) = (\sqrt{x} + 1)(x^2 - x)$ using the product rule and simplify your result.
24. Differentiate $f(x) = (x^3 + 2)(x^2 - 3)$ using the product rule and simplify.
25. Differentiate $f(x) = (\sin x + \cos x)(x^2)$ using the product rule.
26. Differentiate $f(x) = (2x + 3)(\sqrt{x} + x)$ using the product rule and simplify your answer.
27. Differentiate $f(x) = (x^2 + 3x)(x^2 - x + 2)$ using the product rule and simplify.
28. Differentiate $f(x) = (1 + 2x)(x^3 - x)$ using the product rule.
29. Differentiate $f(x) = (3x)(\ln x + 1)$ using the product rule.
30. Differentiate $f(x) = (x^4)(x - 2)$ using the product rule and simplify your answer.