Product rule

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Differentiate $(x+2)(x^2-3)$. [2 marks]

Use $(x^2-3)+(x+2)2x$.

Expand and collect terms.

Answer: $3x^2+4x-3$

2. Differentiate x^3e^x. [2 marks]

The two contributions are $3x^2e^x$ and x^3e^x.

Factor out e^x.

Answer: $e^x(x^3+3x^2)$

3. Find $f'(1)$ for $f(x)=(x^2+2)(x^2-1)$. [2 marks]

The derivative is $2x(x^2-1)+2x(x^2+2)$.

At $x=1$, the first term is zero and the second is 6.

Answer: 6

4. Differentiate $x\cos x$. [2 marks]

Use $1\cos x + x(-\sin x)$.

Keep the negative sign from the cosine derivative.

Answer: $\cos x - x\sin x$

5. Find the tangent to $y = (x^2 + 1)(x + 1)$ at $x = 0$. [3 marks]

The point is $(0, 1)$.

The derivative is $2x(x + 1) + (x^2 + 1)$, giving gradient 1.

Use the point-gradient equation.

Answer: $y = x + 1$

6. A rectangle has width x cm and length $(10 - x)$ cm. Find the derivative of its area and explain why a product rule is relevant. [3 marks]

The area is $x(10 - x)$ and both lengths change.

Differentiate to get $(10 - x) - x$.

Answer: $A'(x) = 10 - 2x$