2.3 The Product Rule

MINDS ON: Let $p(x) = f(x)g(x)$, where $f(x) = (x^2 + 2)$ and $g(x) = (x + 5)$. Show that $p'(x) \neq f'(x)g'(x)$

The Product Rule: If $h(x) = f(x)g(x)$, then $h'(x) = f'(x)g(x) + f(x)g'(x)$

"The derivative of the product of two functions is equal to the derivative of the first function times the second function plus the first function times the derivative of the second function."

Important to note: In some cases, it is easier to expand and simplify the product before differentiating, rather than using the product rule. (we did this yesterday)

Example 1: Differentiate $h(x) = (x^2 - 3x)(x^5 + 2)$ using the product rule.

If we are evaluating the derivative at a specific point, it is sometimes easier to sub this value in before *simplifying* the derivative.

Example 3: Find the value of $h'(-1)$ for the function $h(x) = (5x^3 + 7x^2 + 3)(2x^2 + x + 6)$

Example 4: Find an expression for p'(x) if p(x) = f(x)g(x)h(x).

The Power Rule:	If $f(x) = [g(x)]^n$, then $f'(x) = n[g(x)]^{n-1}g'(x)$

Example 5: For $h(x) = (x^2 + 3x + 5)^6$, find h'(x).

Example 6: Differentiate the rational function $f(x) = \frac{2x+5}{3x-1}$ by first expressing it as a product and then using the product rule.

Example 7: The position, s, in centimetres, of an object moving in a straight line is given by $s = t(6 - 3t)^4$, $t \geq 0$, where t is the time in seconds. Determine the object's velocity at t = 2.