Differentiating Powers Success Criteria

Instruction	Examples
Identify a and n in the formula for each version of ax^n.	$f(x) = 3$: a = 3, n=0 $f(x) = 5x$: a = 5, n=1 $f(x) = 7x^3$: a = 7, n=3 $f(x) = 5x^{-2}$: a = 5, n=-2
Multiply the values of a and n together to give you the new co-efficient to put before the x.	$f(x) = 3$: a = 3, n=0 → 0 $f(x) = 5x$: a = 5, n=1→ 5 $f(x) = 7x^3$: a = 7, n=3 → 21 $f(x) = 5x^{-2}$: a = 5, n=-2 → -10
Reduce the value of n by 1.	$f(x) = 3 \rightarrow f'(x) = 0$ $f(x) = 5x \rightarrow f'(x) = 5$ $f(x) = 7x^3 \rightarrow f'(x) = 21x^2$ $f(x) = 5x^{-2} \rightarrow f'(x) = -10x^{-3}$
Repeat this for each term in the sequence using the formula: The derivative of ax^n is anx^{n-1}	$f(x) = 6x^3 + 4x^2 - 3x + 8$ $\therefore f'(x) = 18x^2 + 4x - 3$
Apply the information you have found.	In the function: $f(x) = 6x^4 - 7x^2 + x - 4$ What is the gradient at $x = 9$?
First find the derivative.	$f'(x) = 24x^3 - 14x + 1$
Apply the value of x=9 to this function.	$f'(9) = 24(9)^3 - 14(9) + 1$ $= 17{,}496 + 126 + 1$ $= 17{,}623$

NOTE: The symbol for the derivative of x can take on three different forms: $\frac{dy}{dx}$, $f'(x)$ or $\dot{x}$.

They all mean exactly the same thing.