Sums of Terms and the General Power Rule

So far, we have only used the Power Rule for expressions involving single terms or one power term and a constant; such as,

$$f(x) = \frac{1}{2}(x-3)^4 + 5 \implies f'(x) = 2(x-3)^3$$

While we won't prove it here, we can extend the Power Rule to expressions involving the sum of any number of power terms. For example, if

$$f(x) = 4x^3 - 5x^2 + x - 4$$

then we can find the slope function by applying the Power Rule to each of the four terms separately (which is essentially using the "Take Apart and Put Back Together" Habit of a Mathematician):

$$f'(x) = 4 \cdot 3x^{3-1} - 5 \cdot 2x^{2-1} + 1 \cdot x^{1-1} - 0 \cdot 4x^{0-1} = 12x^2 - 10x + 1$$

Example

If $f(t) = 3.4t^3 - 5.7t^{-3}$ what is $f'(t)$?

Solution

$$f'(t) = 3.4 \cdot 3t^2 - 5.7(-3)t^{-4} = 10.2t^2 + 17.1t^{-4}$$