Here is an example of using the limit definition to find the derivative. Here, our function is $f(x) = 3x^2 - 7x$.

We start with the general limit definition...

$$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

And substitute our particular $f(x + h)$ and $f(x)$: when doing the $f(x + h)$, be very careful to plug in $(x + h)$ anywhere there is an $x$...

$$f'(x) = \lim_{h \to 0} \frac{3(x + h)^2 - 7(x + h) - (3x^2 - 7x)}{h}$$

Now we expand and distribute things in the numerator...

$$= \lim_{h \to 0} \frac{3x^2 + 6xh + 3h^2 - 7x - 7h - 3x^2 + 7x}{h}$$

Cancel what we can, in this case we can cancel $3x^2$ with $-3x^2$ and $-7x$ with $7x$...

$$= \lim_{h \to 0} \frac{6xh + 3h^2 - 7h}{h}$$

After canceling, we should be able to factor out an $h$ from the numerator...

$$= \lim_{h \to 0} \frac{h(6x + 3h - 7)}{h}$$

And then we can finally cancel that factored out $h$ with the $h$ in the denominator, which lets us go ahead and plug in 0 for $h$ to evaluate the limit...

$$= \lim_{h \to 0} 6x + 3h - 7 = 6x - 7$$

So for $f(x) = 3x^2 - 7x$, the derivative $f'(x)$ is $6x - 7$. So if we wanted to know what the slope of $f(x)$ is at $x = 2$, we can just calculate $f'(2) = 6(2) - 7 = 5$. So the slope of a tangent to $f(x)$ at $x = 2$ is 5.