Example For $f(x) = x^2$, the derivative is:

$$\begin{aligned}
&= \lim_{h \to 0} \frac{(x+h)^2 - x^2}{h} \\
&= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - x^2}{h} \\
&= \lim_{h \to 0} \frac{2xh + h^2}{h} \\
&= \lim_{h \to 0} 2x + h \\
&= 2x + 0 \\
&= 2x
\end{aligned}$$

So for any point x on the graph of $f(x) = x^2$, the slope of the tangent line will be $y = 2x$. Be familiar with the limit of the difference quotient as the definition of the derivative. You will prove more of these in the exercises but the math required is pre-Calculus[1] and generally unneccesary in the understanding of Calculus.

[1] All math before Calculus will be referred to as pre-Calculus in this textbook