Quiz 3

Name:

---

1. (a) Given the function $f(x)$, what is the formula for computing its *derivative*, $f'(x)$?

The derivative of $f(x)$ is

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

(b) Let $f(x) \;=\; x^3$. Compute $f'(x)$ using the formula you stated in part (a).

$$\begin{aligned}
\lim_{h\to 0}\left(\;\frac{f(x+h)-f(x)}{h}\;\right) &= \lim_{h\to 0}\left(\;\frac{(\;x+h\;)^3-x^3}{h}\;\right)\\
&= \lim_{h\to 0}\left(\;\frac{(\;x^3+3x^2h+3xh^2+h^3\;)-x^3}{h}\;\right)\\
&= \lim_{h\to 0}\left(\;\frac{3x^2h+3xh^2+h^3}{h}\;\right)\\
&= \lim_{h\to 0}\left(\;3x^2+3xh+h^2\;\right)\\
&= 3x^2\;.
\end{aligned}$$