

Name: _____

Let $f(x) = x^2 - 9x$. Find $f'(x)$ using the **limit definition**.

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

$$= \lim_{h \rightarrow 0} \frac{(x+h)^2 - 9(x+h) - x^2 + 9x}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{x^2} + 2xh + h^2 - \cancel{9x} - 9h - \cancel{x^2} + \cancel{9x}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{h(2x+h-9)}{h}$$

$$= \lim_{h \rightarrow 0} 2x+h-9$$

$$= 2x-9$$