

### Quiz 3

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Let  $f(x) = 2x^2$ . Find an equation for the line tangent to the graph of  $f$  at the point  $(-1, 2)$ . Use the definition of derivative, not the power rule, to find the slope.

**Solution:** First find the derivative of  $f$  at  $x$  or specifically at  $-1$  using the definition.

$$\begin{aligned} f'(-1) &= \lim_{h \rightarrow 0} \frac{f(-1+h) - f(-1)}{h} = \\ &= \lim_{h \rightarrow 0} \frac{2(-1+h)^2 - 2(-1)^2}{h} = \\ &= \lim_{h \rightarrow 0} \frac{2(1 - 2h + h^2) - 2}{h} = \\ &= \lim_{h \rightarrow 0} (-4h + 2h^2)/h = \\ &= \lim_{h \rightarrow 0} (-4 + 2h) = -4. \end{aligned}$$

Thus the tangent line has the equation  $y - 2 = (-4)(x - (-1))$ , which, in slope intercept form, is  $y = -4x - 2$ .