Quiz 3

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.

$$f'(-1) = \lim_{h \to 0} \frac{f(-1 + h) - f(-1)}{h} = \lim_{h \to 0} \frac{2(-1 + h)^2 - 2(-1)^2}{h} = \lim_{h \to 0} \frac{2(1 - 2h + h^2) - 2}{h} = \lim_{h \to 0} (-4h + 2h^2)/h = \lim_{h \to 0} (-4 + 2h) = -4.$$

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