Name: Solutions Quiz 4 Circle: 9 AM, 10 AM, 11 AM

1. (a) Write down the definition of the derivative for a general function $f(x)$.
   (b)Let $f(x) = 2x^2$. Use the definition of the derivative to find $f'(x)$.

2. Use the derivative rules to find $\frac{d}{dx}(3x^2 sin(x))$.

1a $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

(or $f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$)

1b $f(x) = 2x^2$.

$$f'(x) = \lim_{h \to 0} \frac{2(x+h)^2 - 2x^2}{h} = \lim_{h \to 0} \frac{2x^2 + 4xh + h^2 - 2x^2}{h}$$

$$= \lim_{h \to 0} \frac{h(4x+h)}{h} = 4x + 0 = 4x$$

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2 By the product rule,

$$\frac{d}{dx}\left(3x^2 \sin(x)\right) = 3\left(x^2 \cos x + 2x \sin x\right)$$

$$= 3x^2 \cos x + 6x \sin x.$$