Quiz 3 Solution

August 30, 2017

1. (3 points) If $f(x) = x^2$, find $f'(x)$ **using the limit process**.

   Solution:

   The limit process says $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$.

   Substituting in our equation, we get

   $$\begin{aligned} f'(x) &= \lim_{h \to 0} \frac{(x+h)^2 - x^2}{h} \\ &= \lim_{h \to 0} \frac{(x^2 + 2xh + h^2) - x^2}{h} \text{ by distributing} \\ &= \lim_{h \to 0} \frac{2xh + h^2}{h} \text{ by canceling } x^2 - x^2 \\ &= \lim_{h \to 0} 2x + h \text{ by canceling a factor of } h \text{ from the numerator and denominator} \\ &= 2x \text{ by direct substitution} \end{aligned}$$

   Answer: 2x

2. (1 point) Find the derivative of $y = 3x^{27} - \cos x$. (You don't need to use the limit process.)

   Solution:

   $$\begin{aligned} y' &= 3(27x^{27-1}) - (-\sin x) \\ &= 81x^{26} + \sin x \end{aligned}$$

   Answer: $y' = 81x^26 + \sin x$

3. (1 point) What topic in this class has been most difficult for you?

   Answer: Answers will vary.