MATH 1300: Quiz 1 Rewrite

Due on January 27, 2017 at 10:00am

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1. State the precise definition of the following:

   (a) A *function* f:

4. Consider the function $f(x) = x^2 - 2x + 1$. Let us evaluate the difference quotient

$$\frac{f(x+h) - f(x)}{h}$$

   (b) Find $f(x+h) - f(x)$. Do this by taking your expression from (a), and subtracting the original function $f(x)$. If done correctly, every remaining term should involve an h.

$$\begin{aligned} f(x+h) - f(x) &= (x+h)^2 - 2(x+h) + 1 - (x^2 - 2x + 1) \\ &= x^2 + h^2 + 2xh - 2x - 2h + 1 - x^2 + 2x - 1 \\ &= \boxed{h^2 + 2xh - 2h} \end{aligned}$$

   Error: My error in this problem was simply writing x^2 instead of h^2. I had all the work correct up to the last step, where I wrote x instead of h.

   (c) Find $\frac{f(x+h)-f(x)}{h}$. Do this by taking your expression from (b), dividing it by h, and performing any cancelations. Your answer should no longer be a fraction.

$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{h^2 + 2xh - 2h}{h} \\ &= \frac{h(h + 2x - 2)}{h} \\ &= \boxed{h + 2x - 2} \end{aligned}$$

   Error: This error is simply a continuation from the previous part (b), where I wrote x instead of h.

5. State the domain of the following functions:

   (a) $f(x) = \frac{x+4}{x^2-9}$

$$(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$$

   Error: My error in this problem was a simple mistake in confusing the 4 in the numerator with the answer, so I ended up writing 4 instead of the obvious 3.

   (b) $f(x) = \sqrt{2 - x}$

$$(-\infty, 2]$$

   Error: My error in this problem was forgetting that you cannot square root 0.

8. If $f(x) = \sqrt{x^2 - 3}$ and $g(x) = \ln 2x + 5$, find the following compositions:

   (a) $(f \circ g)(x) = \sqrt{\ln(2x + 5) - 3}$
   Error: I simply forgot to rewrite the "ln" part of the function.

   (b) $(g \circ f)(x) = \ln(2(\sqrt{x^2 - 3}) + 5)$
   Error: I simply forgot to rewrite the "ln" part of the function.

10. True of False? If true, explain why. If false, explain why OR provide a counterexample. Some of these are intentionally tricky, so be careful!

(b) If $x^2 = 4x$, then $x = 4$ is **the** solution.

$$\begin{aligned} x^2 &= 4x \\ x^2 - 4x &= 0 \\ x(x-4) &= 0 \\ 4(4-4) &= 0 \\ 0(0-4) &= 0 \end{aligned}$$

False.

Error: As you discussed in class, I divided by x, and because you cannot divide by 0, the only way you could do so would be if $x \neq 0$.

(c) $\sqrt{16} = \pm 4$
False.

Error: My error in this problem was I thought of it as solving for x^2, but simply the $\sqrt{16}$ is a positive 4.

(d) $\frac{2}{3}x = \frac{2x}{3}$
True.

$$\frac{2}{3}x = \frac{2 \times x}{3} = \frac{2x}{3}$$

Error: My error in this problem was not explaining my answer.

(e) $\sqrt{x^2+4} = x + 2$
False.

$$\begin{aligned} \sqrt{x^2+4} &= x+2 \\ x+2 &\neq (x+2)^2 \end{aligned}$$

Error: My error in this problem was not actually explaining my thoughts.