Remind me to hit "RECORD!"

Last Question of Week 2 Ass'm't:

Let $f(x) = x^2 - 3x + 5$

(a) $\lim_{h \to 0}$

(a) $\frac{f(2+h) - f(2)}{h} = \frac{(2+h)^2 - 3(2+h) + 5 - (2^2 - 3(2) + 5)}{h}$

$= \frac{\cancel{2^2} + 2(2)(h) + h^2 - 6 - 3h + 5 - \cancel{2^2} + 3(2) - 5}{h}$

$= \frac{4h + h^2 - 3h}{h} = \frac{h + h^2}{h} = \frac{h(1+h)}{h} = \underset{(h \neq 0)}{1 + h} \xrightarrow{h \to 0} \boxed{1 = f'(2)}$

(b) $\frac{f(x) - f(2)}{x - 2} = \frac{x^2 - 3x + 5 - (2^2 - 3(2) + 5)}{x - 2}$ $\lim_{x \to 2}$

$= \frac{x^2 - 3x + 5 - 4 + 6 - 5}{x - 2} = \frac{x^2 - 3x + 2}{x - 2} = \frac{\cancel{(x-2)}(x-1)}{\cancel{x-2}} = \underset{x \neq 2}{x - 1} \xrightarrow{x \to 2} 2 - 1 = 1 = f'(2)$ ✓

(c) $\frac{f(x+h) - f(x)}{h} = \frac{(x+h)^2 - 3(x+h) + 5 - (x^2 - 3x + 5)}{h}$

$= \frac{x^2 + 2xh + h^2 - 3x - 3h + 5 - x^2 + 3x - 5}{h} = \frac{2xh - 3h}{h} = \underset{h \neq 0}{2x - 3} \xrightarrow{h \to 0} \boxed{2x - 3 = f'(x)}$

(d) $\lim_{x \to c} \frac{f(x) - f(c)}{x - c} = \frac{x^2 - 3x + 5 - (c^2 - 3c + 5)}{x - c}$

$= \frac{x^2 - 3x + 5 - c^2 + 3c - 5}{x - c} = \frac{x^2 - 3x - c^2 + 3c}{x - c}$

$= \frac{x^2 - c^2 - 3x + 3c}{x - c} = \frac{(x-c)(x+c) - 3(x-c)}{x - c}$ $\lim_{x \to c}$

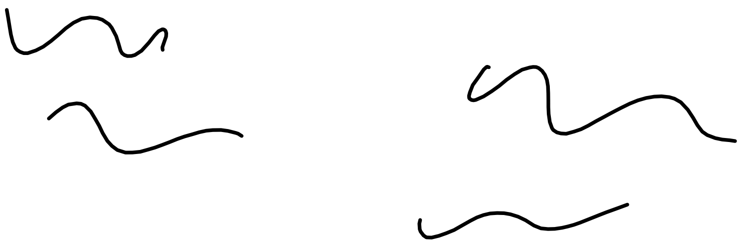
$= \frac{(x-c)[x + c - 3]}{x - c} = \underset{(x \neq c)}{x + c - 3} \xrightarrow{x \to c} c + c - 3 = \boxed{2c - 3 = f'(c)}$

~~§3.~~ §2.6? Mean Value Theorem.

T2.1 Mean Value Theorem
Assume f is continuous on $[a,b]$, and differentiable on (a,b). Then there is a $c \in (a,b)$ such that f

$$f'(c) = \frac{f(b)-f(a)}{b-a}$$

E Write down the question.



Formal and Heuristic learning

Scope out the book

Solve homework problems

Next Theorem
Rolle's Theorem (Actually goes ahead of Mean
Value Theorem

EXAMPLE

Then leave the rest of the page blank. Come back to it after you start working the homework, and have the example to work through, in detail, to help you with the exercise.

This is heuristic learning (Learning by problem-solving).

A lot of times, the formal theorems and definitions will go right over your head, as well as *why* they're worded the way they are.

That's why you come back to it, a few or several times. You might not realize it until you're trying to solve an exercise and you get that "Aha!" moment.

I bet you have your own routines, and aren't eager to change your ways, but I'm telling you that as you encounter more and more complicated/abstract ideas in writing, you may be able to speed up the absorption/assimilation/understanding of new knowledge by not trying to understand everything perfectly on the first pass.

Writing it down is the first step *toward* understanding.