On the first day of class, I jumped you to 1.4 (The tangent-line problem) to motivate what we'll be doing all or most of the semester, the basic underlying idea of the limit as the 2nd point approaches the first point in the difference quotient

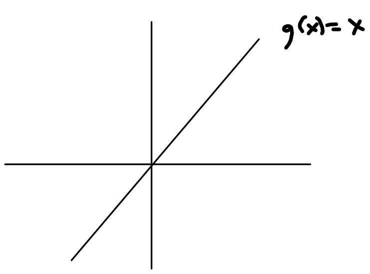
$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{f\left(x_2\right)-f\left(x_1\right)}{x_2-x_1}=\frac{f\left(x+h\right)-f\left(x\right)}{h} = f'(x)$$

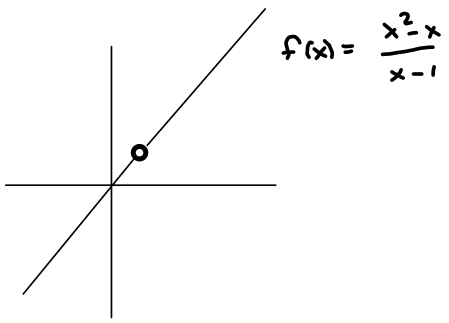
Then I jumped you to Section 2.2, where we finally see that the LIMIT of this difference quotient (as *h* approaches 0) gives us a function we can use to find the slope of a curve at any point.

I usually don't like skipping ahead, but I think it's helpful for you to get a preview of this and one or two key techniques you'll use over and over, because it's a long way to the punchline in this joke, and it's hard to understand why you're doing the stuff you're doing without one or two "spoilers."

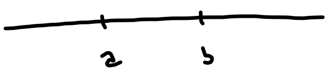
Recall I found $f'(x)$ for $y=x^2$ & $y=\sqrt{x}$.

§ 1.1 #2 $\quad f(x) = \frac{x^2-x}{x-1} = \frac{x(x-1)}{x-1} = x$ $\quad (x \neq 1)$

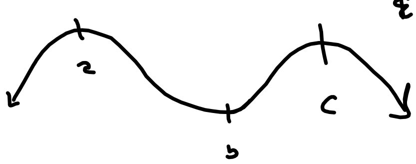




f is increasing on $[a,b]$ if $a < x_1 < x_2 < b \implies f(x_1) < f(x_2)$



This says that f is decreasing on $[a,b]$ & increasing on $[b,c]$ & so b is in an interval of increase & decrease, ie, by this definition, the intervals of increase & decrease have one point of overlap.



Difference quotient at a single point (Yesterday, I did them all in general.):

Evaluate the difference quotient $\frac{f(3+h)-f(3)}{h}$

for $f(x)=x^2-3x+7$:

$\rightarrow 0!$

3^2

$$\frac{f(3+h)-f(3)}{h} = \frac{(3+h)^2-3(3+h)+7-(3^2-3(3)+7)}{h}$$

$$\cancel{= \frac{9^2+2(3)h+h^2-9-3h+7-3^2+3(3)-7}{h}}$$

$$\cancel{= \frac{81+6h+h^2\cancel{-9}\cancel{+7}\cancel{+9}\cancel{-7}-3h}{h} = 81+3h+h^2}$$

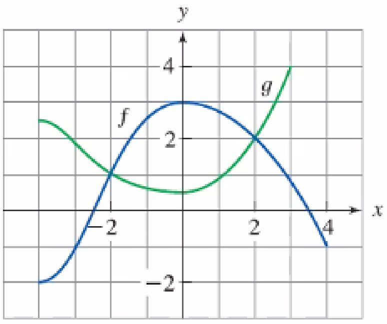
$$\left((3+h)^2 = 3^2+2(3)h+h^2 = 9+6h+h^2 \right)$$

$$= \frac{9+6h+h^2-9-3h+7-9+9-7}{h} = \frac{3h+h^2}{h} = \frac{h(3+h)}{h} = 3+h$$

$$(h \neq 0)$$

4. [10/11 Points] DETAILS PREVIOUS ANSWERS SCALC9 1.1.004.

The graphs of f and g are given in the figure.



I missed the fact that $g(x)$ cuts off after $x=3$, at first.

(a) State the values of $f(2)$ and $g(-2)$.

$f(2)$ = 2

$g(-2)$ = 1

(b) Which is larger, $f(-4)$ or $g(-4)$?

○ $f(-4)$

● $g(-4)$

(c) For what values of x is $f(x) = g(x)$? (Enter your answers as a comma-separated list.)

x = $-2,2$