1.4 - Ugh. Motivating the later lessons on limits by confirming that these objects (difference quotients) do apear to converge to something, as the distance between two points on a secant line approach one another.

1.5 -

Questions on 1.1 - 1.3?

How to bring up past assignments for review:

Scroll down to "Past Assignments" and look at that stuff.

"Ask Your Teacher" is still functional, but it won't let you enter any answers without putting in for an extension.

Extension Requests are easy:

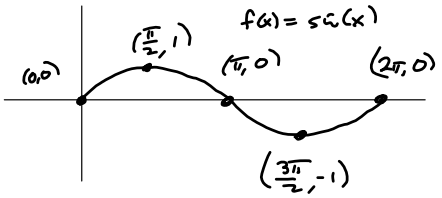
"Automatic" there's no waiting but you get the 30% deduction.

"Manual" is as slow as I am. For quickest service, put in the request and call me at 970-290-0550.

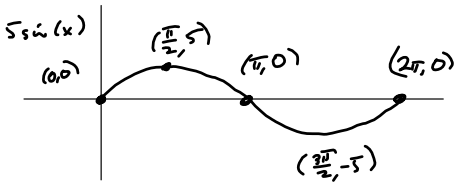
1.3 Graph 1 period of $5\sin\left(\frac{\pi}{6}(x-7)\right)+8$

$= 5\sin\left(\frac{\pi}{6}x - \frac{7\pi}{6}\right)+8$. Show highs, lows, & midline points

Want $g(x) = 5\sin\left(\frac{\pi}{6}(x-7)\right)+8$



Do stretching 1st:

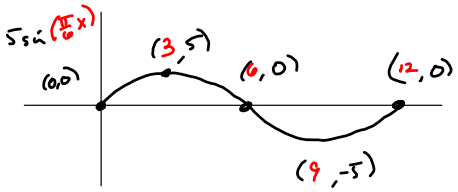


$af(x)$:

$y \mapsto ay$

$5f(x)$: $5\sin(x)$

$y \mapsto 5y$



$af(bx)$ from $af(x)$:

$3\sin\left(\frac{\pi}{6}x\right)$ .. $3\sin(x)$

$x \mapsto \frac{6}{\pi}x$

$\frac{6}{\pi}\cdot\frac{\pi}{2} = 3$

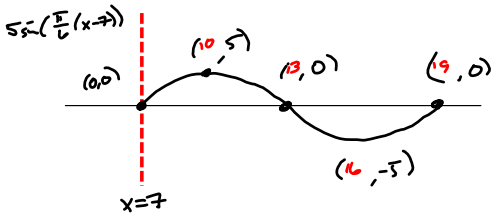
$\pi\cdot\frac{6}{\pi} = 6$

$\frac{3\pi}{2}\cdot\frac{6}{\pi} = 9$

Goal: $5\sin\left(\frac{\pi}{6}(x-7)\right)+8$

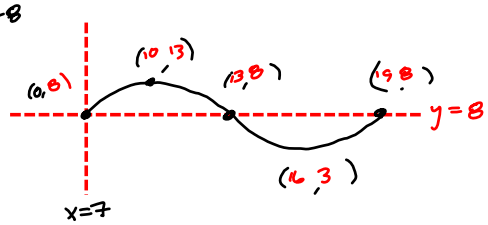
$5\sin\left(\frac{\pi}{6}(x-7)\right)$ RIGHT 7:

$x \mapsto x+7$



$5\sin\left(\frac{\pi}{6}(x-7)\right)+8$

$= g(x)$.

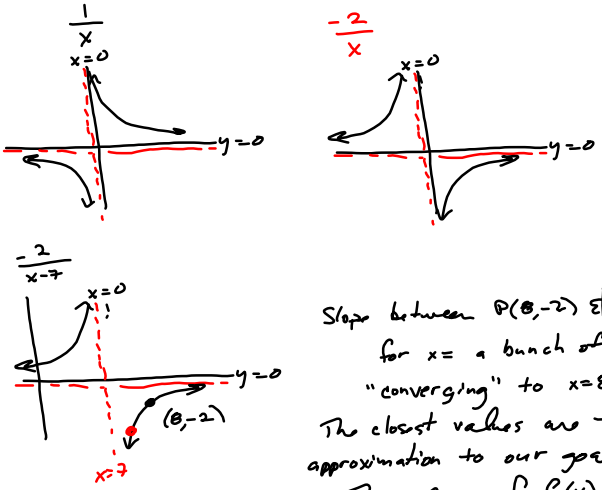


1.4 : Motivating the limit of the difference quotient, but keeping the # of exercises to a minimum.

$f(x) = \frac{2}{7-x}$. We build some secant lines that include the point $(8, f(8)) = (8, -2)$

$f(8) = \frac{2}{7-8} = \frac{2}{-1} = -2$

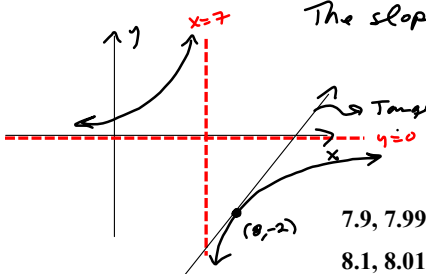
$\frac{2}{7-x} = -\frac{2}{x-7}$



Slope between $P(8,-2)$ & $Q(x, f(x))$ for $x =$ a bunch of values "converging" to $x=8$

The closest values are the closest approximation to our goal:

The slope of $f(x)$ @ $x=8$.



→ Tangent line to $f(x)$ @ $x=8, y=-2$.

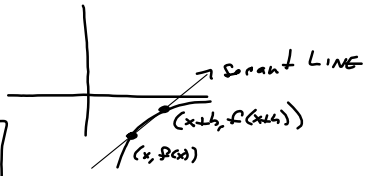
7.9, 7.99, 7.999, 7.9999,

8.1, 8.01, 8.001, 8.0001

This is to motivate LIMITS (§1.6, 1.5)

$\frac{f(x+h) - f(x)}{h}$ $\xrightarrow{h \to 0}$ SLOPE OF TANGENT !

$\frac{\frac{2}{7-(x+h)} - \frac{2}{7-x}}{h}$



$= \frac{1}{h}\left[\frac{2(7-x) - 2(7-(x+h))}{(7-(x+h))(7-x)}\right]$

$\left(\frac{2}{7-(x+h)}\right)\left(\frac{7-x}{7-x}\right) - \left(\frac{2}{7-x}\right)\left(\frac{7-(x+h)}{7-(x+h)}\right)$

$= \frac{1}{h}\left[\frac{14-2x-14+2x+2h}{(7-(x+h))(7-x)}\right] = \frac{1}{h}\left[\frac{2h}{(7-(x+h))(7-x)}\right]$

$= \frac{2}{(7-(x+h))(7-x)}$ $\xrightarrow{h \to 0}$ $\frac{2}{(7-x)(7-x)} = \frac{2}{(7-x)^2}$! $= f'(x)$ = Slope @ x !

$(h \neq 0)$

So, the slope of $f(x)$ @ $x=8$ is

$\frac{2}{(7-8)^2} = \frac{2}{(-1)^2} = 2$!