

Bellwork:

1. $f(x) = 2 - x^2$. Find and simplify $f(3+h)$
2. $g(x) = \sqrt{x}$. Find and simplify $g(1+h)$.

What is the difference quotient? Look it up if you don't know!

What is a limit?

$$\begin{aligned} \textcircled{1} \quad f(x) &= 2 - x^2 \\ f(3+h) &= 2 - (3+h)^2 \\ &= 2 - (9 + 6h + h^2) \\ &= 2 - 9 - 6h - h^2 \\ &= -7 - 6h - h^2 \end{aligned}$$

WHAT IS "SORT OF"
ANOTHER NAME FOR
THE DIFFERENCE
QUOTIENT.

$$\begin{aligned} \textcircled{2} \quad g(x) &= \sqrt{x} \\ g(1+h) &= \sqrt{1+h} \end{aligned}$$

Difference Quotient

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

$\Delta = \text{delta}$
"change"
 $m = \frac{\Delta y}{\Delta x}$

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

BW#1: Find Difference Quotient for
 $f(x) = 2 - x^2$.

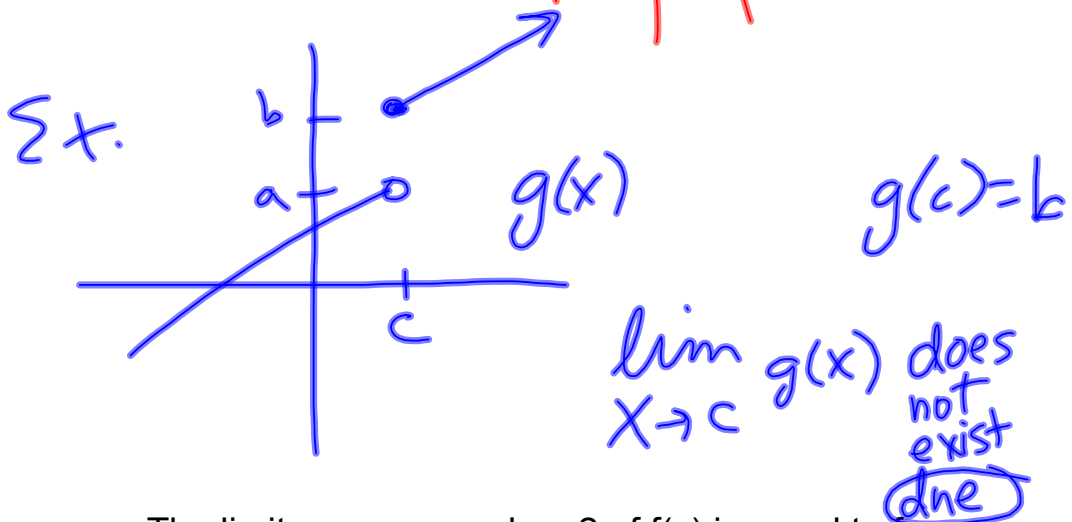
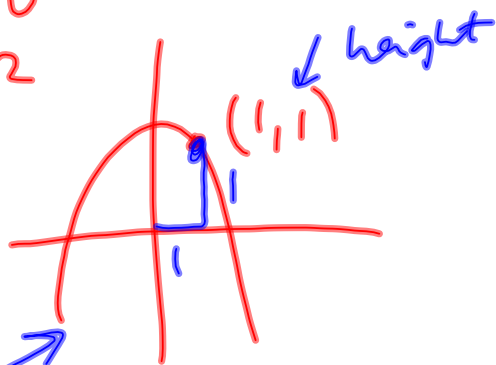
$$\begin{aligned} \text{D.Q.} &= \frac{f(x+h) - f(x)}{h} \\ &= \frac{2 - (x+h)^2 - [2 - x^2]}{h} \\ &= \frac{\cancel{2} - (\cancel{x}^2 + 2xh + h^2) - \cancel{2} + \cancel{x}^2}{h} \\ &= \frac{-2xh - h^2}{h} \\ &= \frac{h(-2x - h)}{h} \\ &= -2x - h \end{aligned}$$

$$f(x) = 2 - x^2$$

What is the ht of function @ $x=1$?

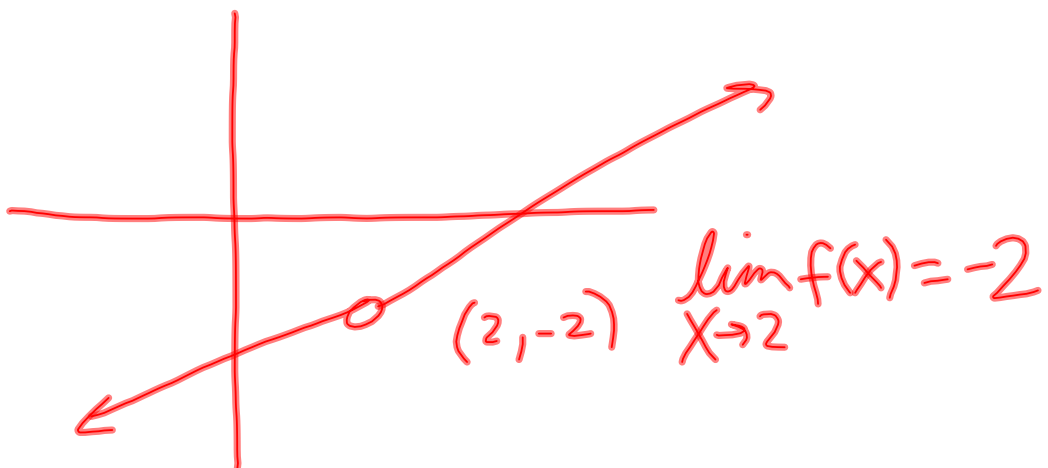
$$f(1) = 2 - 1^2$$

$$f(1) = 1$$



The limit as x approaches 2 of $f(x)$ is equal to four.

$$\lim_{x \rightarrow 2} f(x) = 4$$



$$\text{Evaluate } \lim_{x \rightarrow -1} (3-4x) = 7$$

Plug in $x = -1$

$$\begin{aligned} & 3 - 4(-1) \\ & 3 + 4 \\ & 7 \end{aligned}$$

$$\text{Evaluate } \lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x - 2}$$

$$\text{Try to plug in } x = 2 : \frac{2^2 + 3 \cdot 2 - 10}{2 - 2}$$

$$\frac{4 + 6 - 10}{0}$$

Try factoring

indeterminant form $\frac{0}{0}$

$$\lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x - 2}$$

$$\lim_{x \rightarrow 2} \frac{(x+5)(\cancel{x-2})}{(\cancel{x-2})}$$

$$\lim_{x \rightarrow 2} x + 5$$

now plug in $x = 2$

$$2 + 5 = 7$$

$$\lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x - 2} = 7$$

A limit is the INTENDED HEIGHT of a function.

