IB Math HL 1 Introduction to Limits

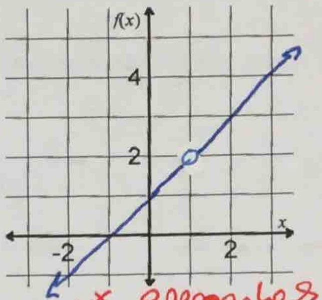
undefined

$\frac{5}{0}$ $\frac{0}{0}$ $\frac{\infty}{\infty}$

indeterminant form

1. On your GFC, plot the graph of $f(x)=\dfrac{x^2-1}{x-1}$

Sketch the result. $f(1)=\frac{1^2-1}{1-1}=\frac{0}{0}$ undefined



2. Complete the table.

x approaches 1 → ← x approaches 1

x	0.8	0.9	0.99	0.999	1	1.001	1.01	1.1	1.2
$f(x)$	1.8	1.9	1.99	1.999	undef	2.001	2.01	2.1	2.2

f(x) gets closer to 2 → ← f(x) gets closer to 2

3. Pre-Calculus Question: What feature does the graph of $f(x)$ have at $x = 1$? A hole / removable discontinuity

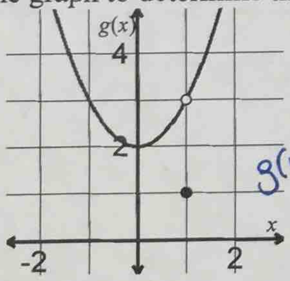
Calculus Question: What is the **limit** of $f(x)$ as x approaches 1?

Same question in Calculus notation: $\lim_{x\to 1} f(x) =$ 2

Informal Definition of Limit #1:	Informal Definition of Limit #2:
What y-value does $f(x)$ get <u>close</u> to as x <u>approaches</u> c? Close: as close as you need to be convinced of the result Approaches: closer and closer but not actually there* *This means that, for the purpose of this limit, we don't care what f(c) is or if it exists.	What is going on with the value of f(x) in a neighborhood of x = c?

4. Use the graph to determine the indicated limit.

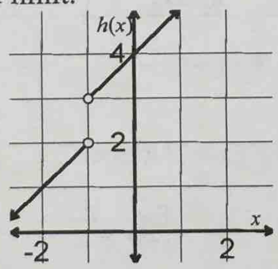
a.



$g(1)=1$

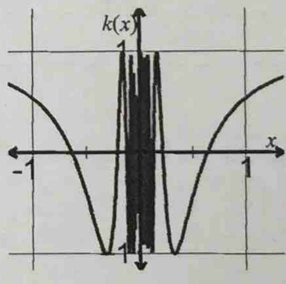
$\lim_{x\to 1} g(x) = 3$

b.



$\lim_{x\to -1} h(x) =$ DNE

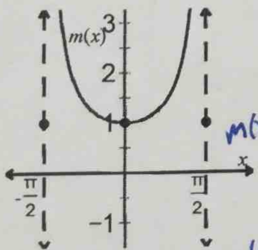
c.



$k(x)=\cos\left(\frac{1}{x}\right)$

$\lim_{x\to 0} k(x) =$ DNE

d.

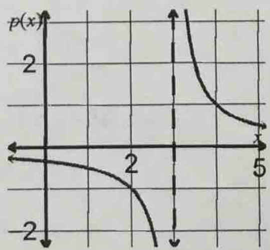


$m(x)=\sec x$

$m(0)=1$

$\lim_{x\to 0} m(x) = 1$

e.



$\lim_{x\to 3} p(x) =$ DNE