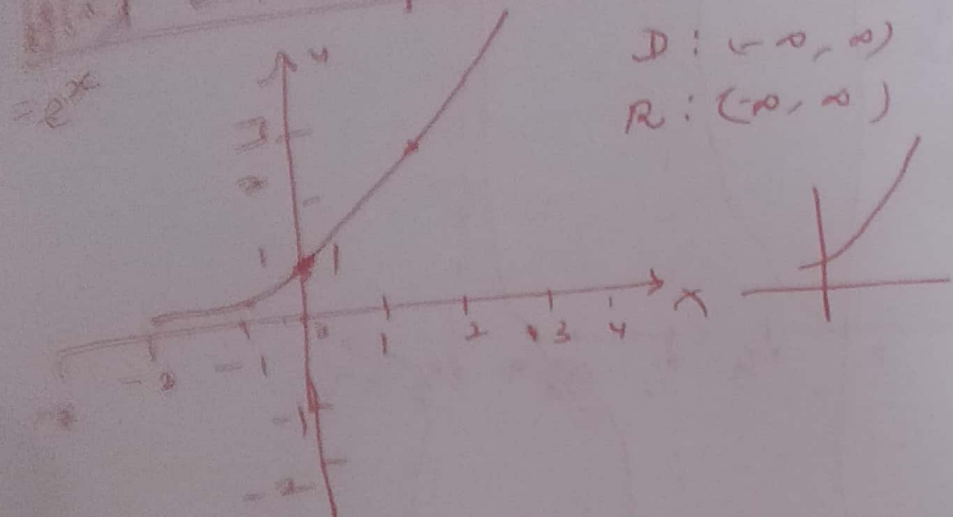


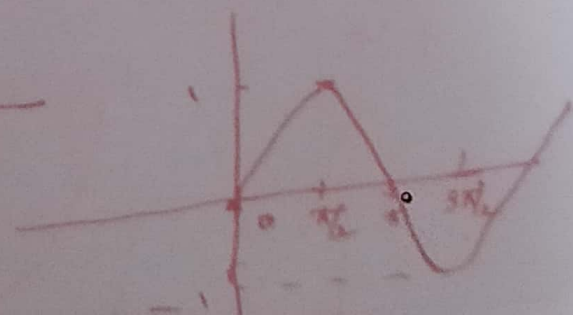
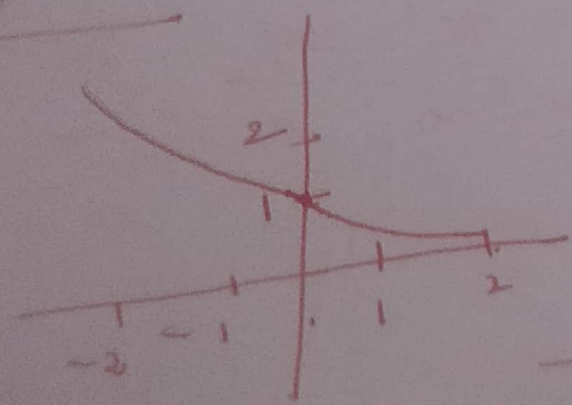
# Graphs

$y = e^x$ ,  $y = e^{-x}$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\cot x$ , ...  
 $\log x$

$x$	-2	-1	0	1	2	3
$e^x$	0.135	0.368	1	2.718	7.389	20.0



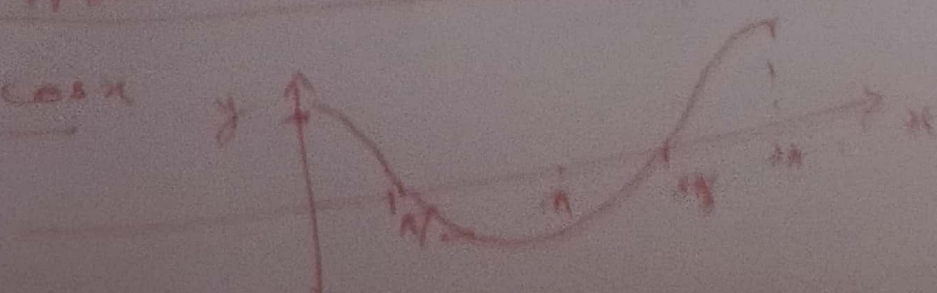
$y = e^{-x}$



$y = \sin x$

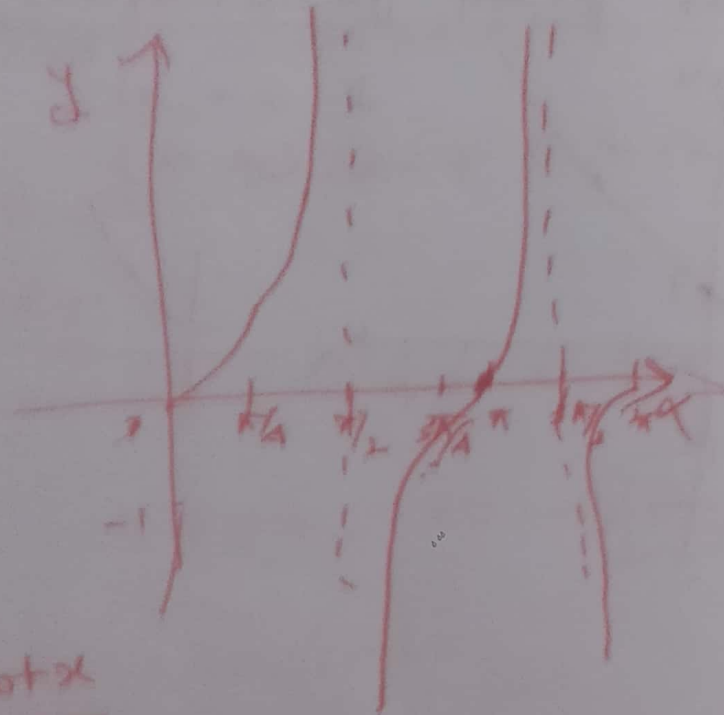
$x$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$\sin x$	0	1	0	-1	0

$y = \cos x$



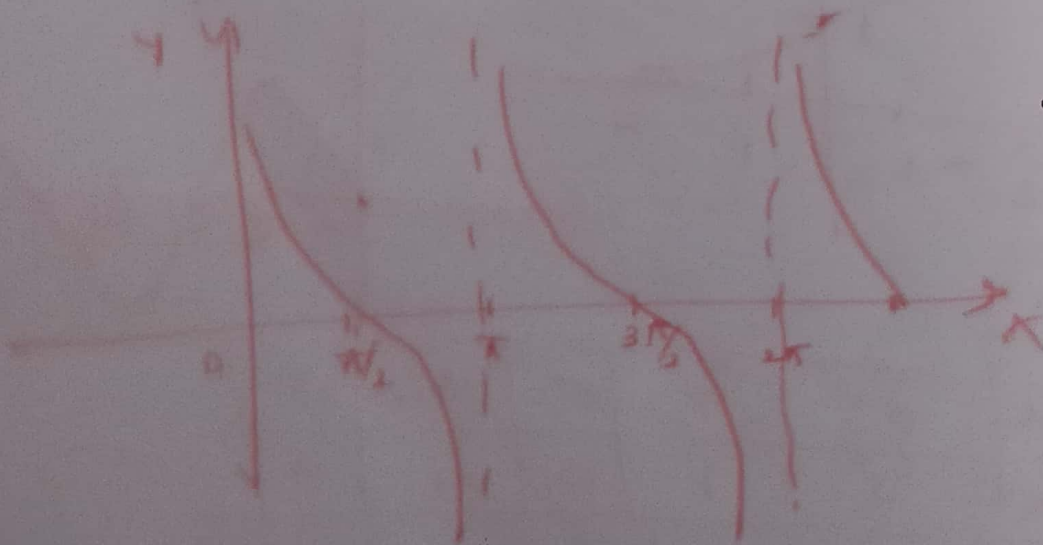
$$y = \tan x$$

$x$	0	$\pi/4$	$\pi/2$	$3\pi/4$	$\pi$	$5\pi/4$	$3\pi/2$	$7\pi/4$	$2\pi$
$y = \tan x$	0	1	$\infty$	-1	0	1	$\infty$	-1	0



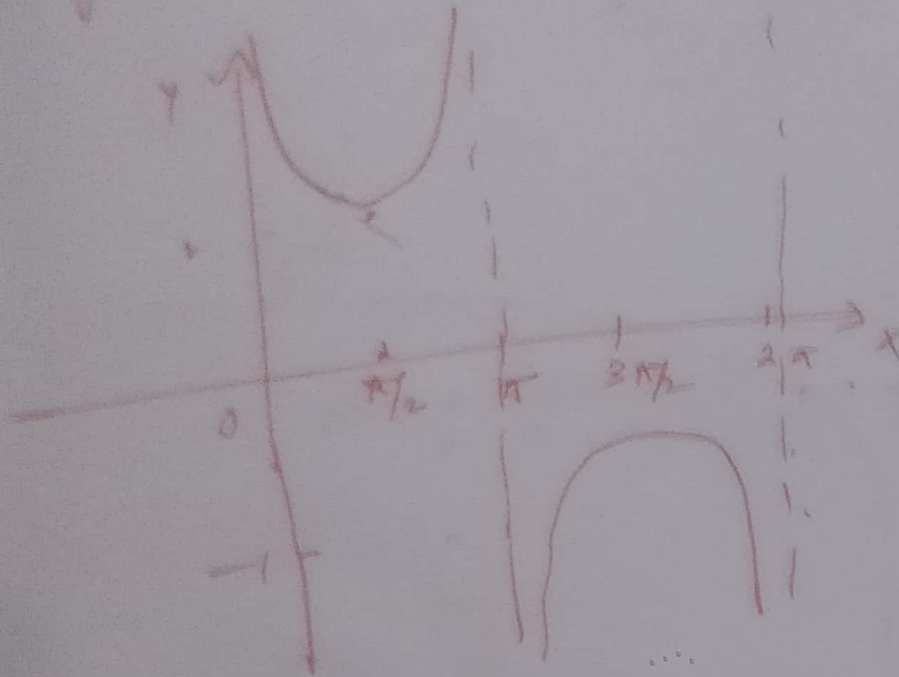
$$y = \cot x$$

$x$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \cot x$	$\infty$	0	$\infty$	0	$\infty$



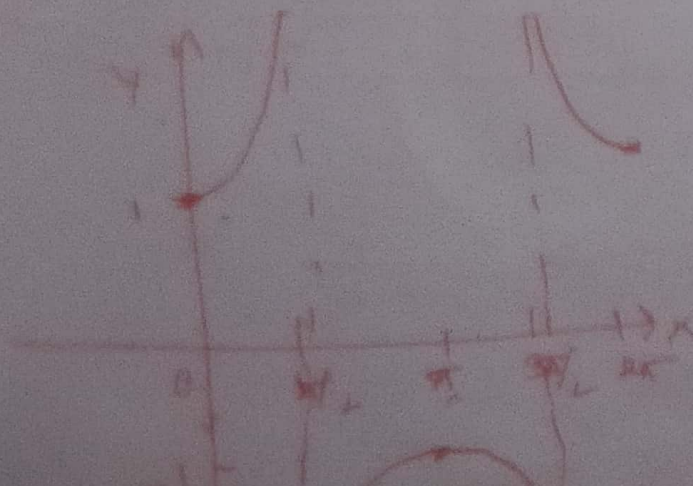
$$y = \operatorname{Cosec} x, \quad y = \sec x$$

$x$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y(x)$	$\infty$	1	$\infty$	-1	$\infty$



$y = \sec x$	$x$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y(x) =$		1	$\infty$	-1	$\infty$	1

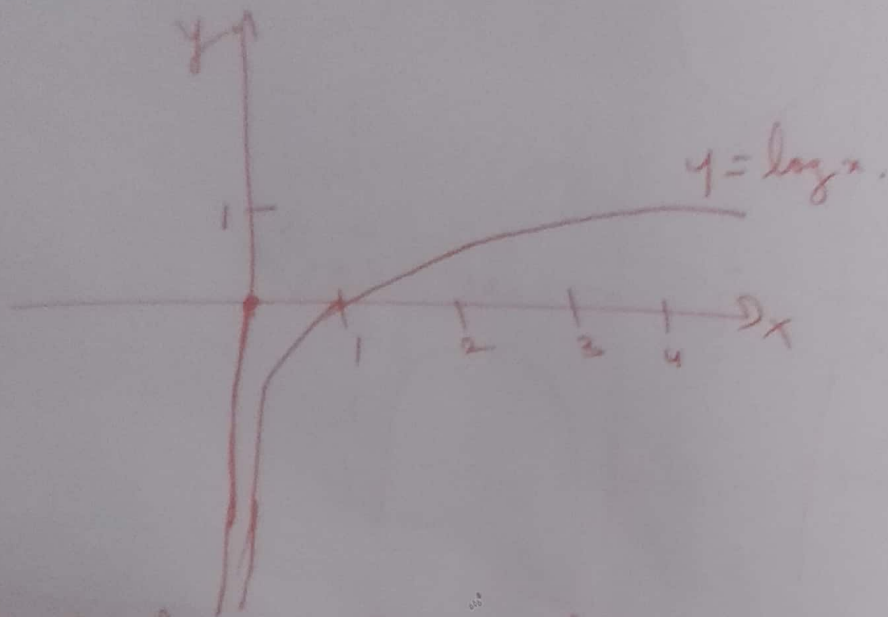
$$y = \frac{1}{\cos x}$$





$$y = \log x$$

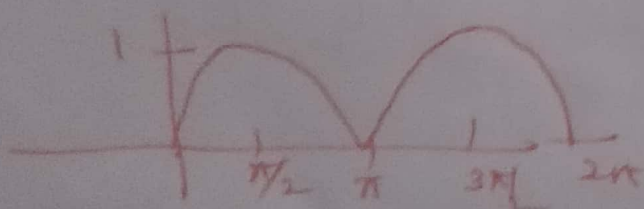
$x$	0	1	2	3
$y(x)$	$\infty$	0	$\frac{0.30}{1/2}$	0.477



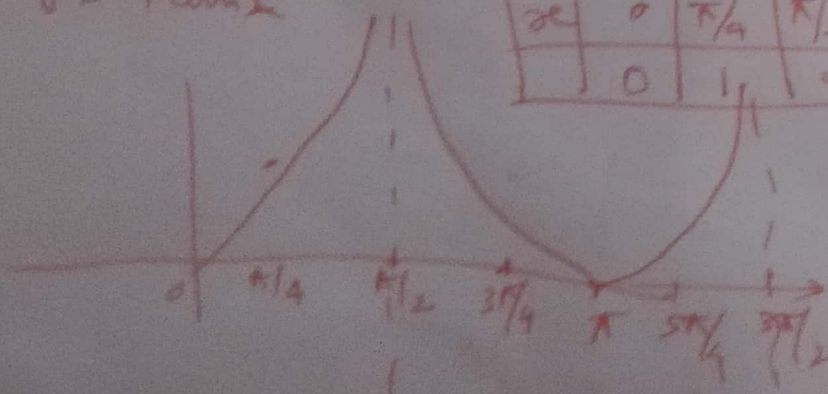
$$y = \sin^2 x, \cos^2 x, \tan^2 x$$

$$y = \sin^2 x$$

$$y = \cos^2 x$$



$$y = \tan^2 x$$



$x$	0	$\pi/4$	$\pi/2$	$3\pi/4$	$\pi$	$5\pi/4$
$y$	0	1	$\infty$	1	0	1

# Hyperbolic function

$$y = \sinh x = \frac{e^x - e^{-x}}{2} \quad \checkmark$$

$$y = \cosh x = \frac{e^x + e^{-x}}{2} \quad \checkmark$$

$$y = \tanh x = \frac{\sinh x}{\cosh x} = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

$$y = \coth x$$

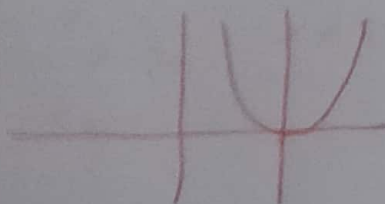
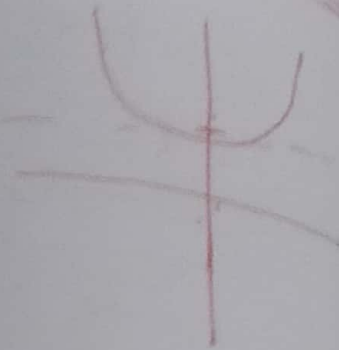
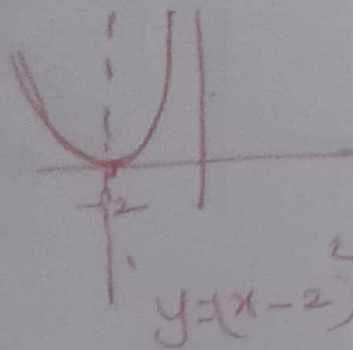
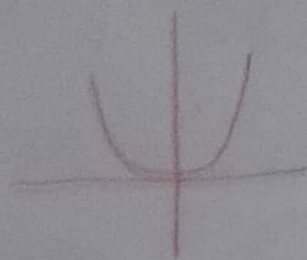
$$y = |x|, x^2, -|x| \dots \quad |x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$



$$y = x^2$$

$$y = \left( \frac{x+2}{x} \right)^2$$

$$y = \left( \frac{x^2}{x} \right)^2$$



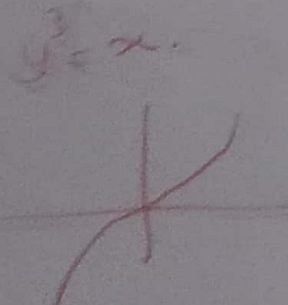
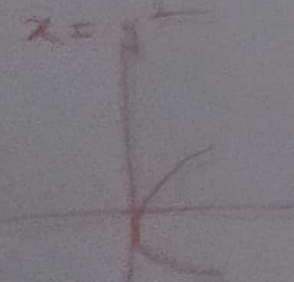
$$\begin{aligned} e^{ix} &= \cos x + i \sin x \\ e^{-ix} &= \cos x - i \sin x \end{aligned}$$

$$\begin{aligned} e^x &= \cosh x + \sinh x \\ e^{-x} &= \cosh x - \sinh x \end{aligned}$$

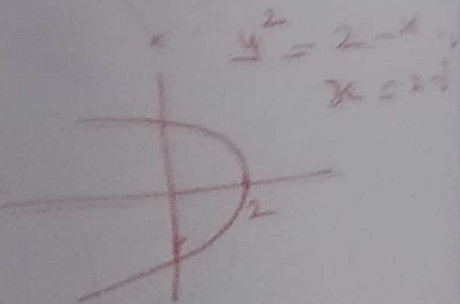
$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

$$y = \sqrt{x}, \quad y = \sqrt[3]{x}$$

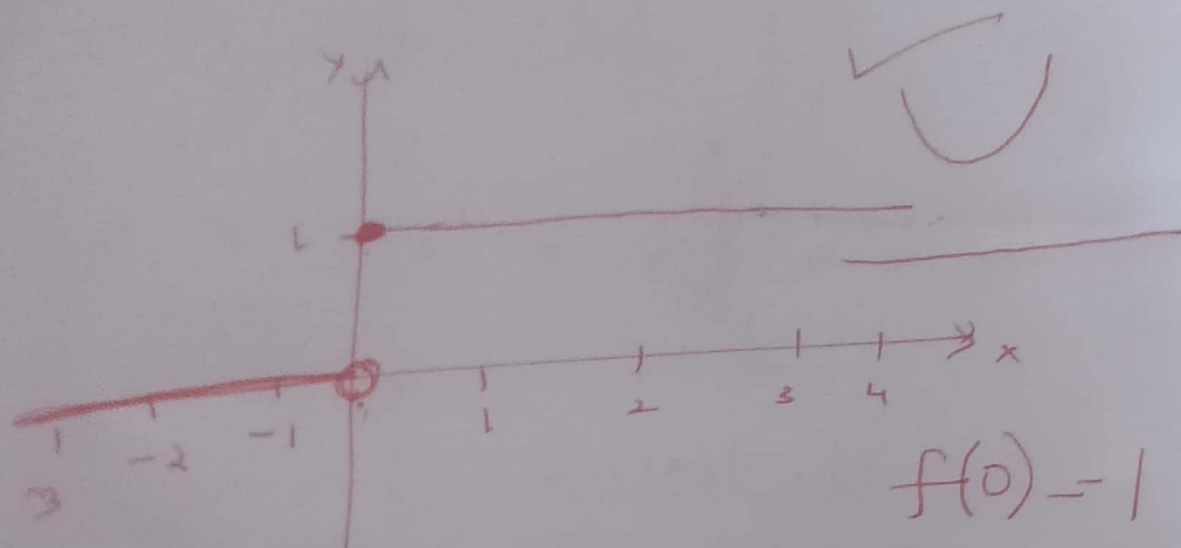


$$y = \sqrt{2-x}$$



# Limit , Continuity

$$f(x) = \begin{cases} 0, & x < 0 \\ 1, & x \geq 0 \end{cases}$$



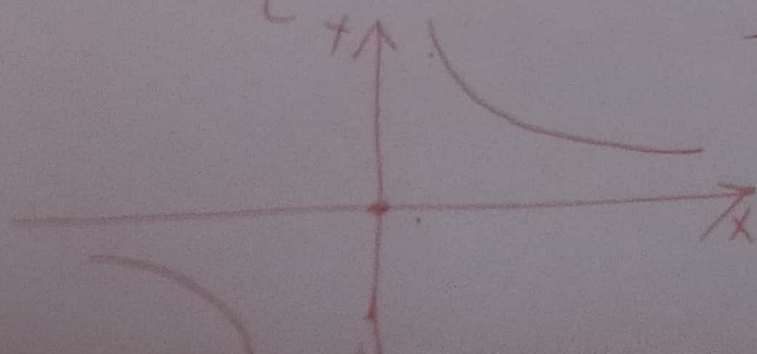
$$f(0) = 1$$

$$\lim_{x \rightarrow 0^-} f(x) = 0 \neq$$

$$\lim_{x \rightarrow 0^+} f(x) = 1$$

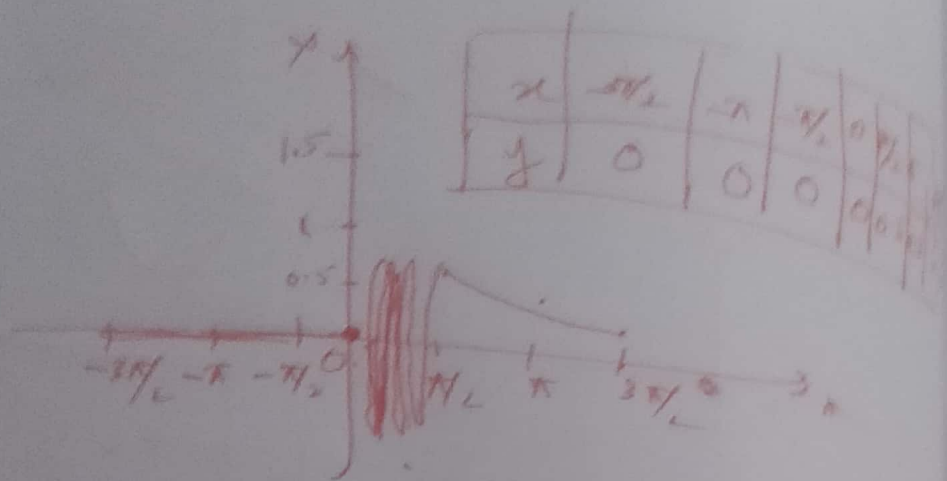
$$y = \frac{1}{x}$$

$$g(x) = \begin{cases} \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$





$$h(x) = \begin{cases} 0, & x \leq 0 \\ \sin \frac{1}{x}, & x > 0 \end{cases}$$

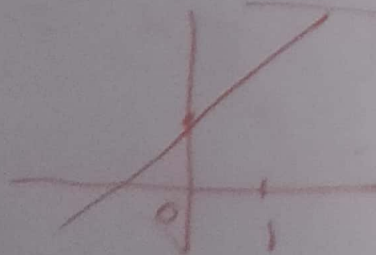


$$\lim_{x \rightarrow x_0} f(x) = L$$

$$x \rightarrow x_0$$

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

$$g(x) = \frac{x+1}{x-1}$$

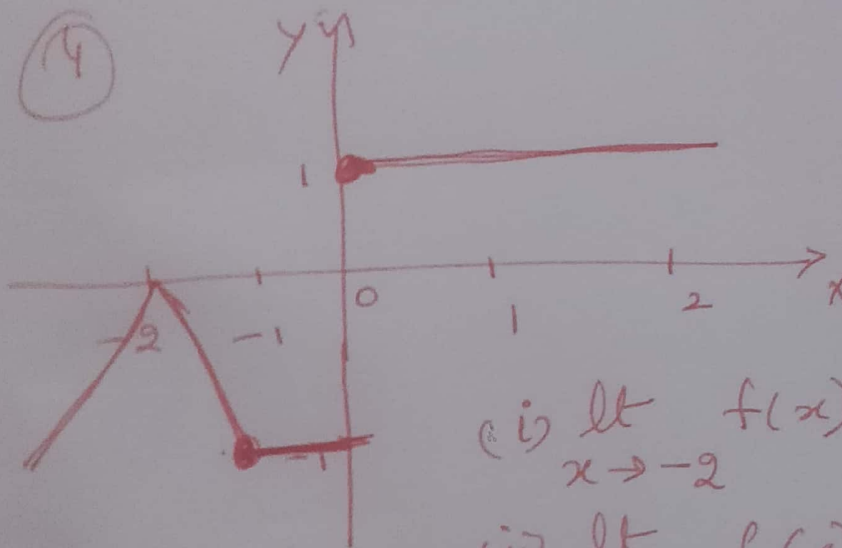




$$(1) \lim_{x \rightarrow 0} \frac{x}{|x|} = ?$$

$$(2) \lim_{x \rightarrow 1} \frac{1}{x-1} = ?$$

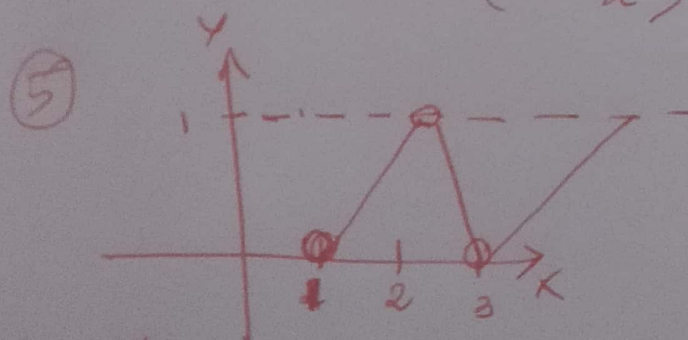
$$(3) f(x) = \frac{x}{|x|}$$



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

(ii)  $\lim_{x \rightarrow -1} f(x) =$

(ii)  $\lim_{x \rightarrow 0^+} f(x) =$



(i)  $\lim_{x \rightarrow 2} g(x) =$

(ii)  $\lim_{x \rightarrow 3} g(x) =$

(iii)  $\lim_{x \rightarrow 1} g(x) =$