ULTIMATE KCET

CRASH COURSE 2026

Mathematics | Lecture - 01

Domain & Range

By – Guru sir

Recap *of previous lecture*

1. $f(x) = x^2$
2. completing the square form
3. $f(x) = |x|$
4. $f(x) = [x]$

Topics *to be covered*

1. wavy curve method
2. logarithmic func
3. square root func
4.

zero of a polynomial

The value for which the expression $f(x)=0$ is called zero of a Polynomial

$f(x)=x^2+3x+2$

$f(-1)=1-3+2=0$

$f(-2)=4-6+2=0$

$x=-1$ & $x=-2$ are zero's of the Polynomial

if $x=-1$ & $x=-2$ are zero's of a Polynomial

Then $(x+1)$ & $(x+2)$ are the factors of a Polynomial

Wavy Curve method:-

(1) All the factors should be to the left of inequality sign & to the right there should be zero

(2) make sure the coefficient of 'x' in each factor is +1

(3) Find critical Point of each factors

Ex:-

$$(x+2)(3-2x) \geq 0$$

$$(x+2)\left[-2\left(x-\frac{3}{2}\right)\right] \geq 0$$

$$-2(x+2)\left(x-\frac{3}{2}\right) \geq 0$$

$\div$ by -2

$$(x+2)\left(x-\frac{3}{2}\right) \leq 0$$

critical Points are

$x = -2, \frac{3}{2}$

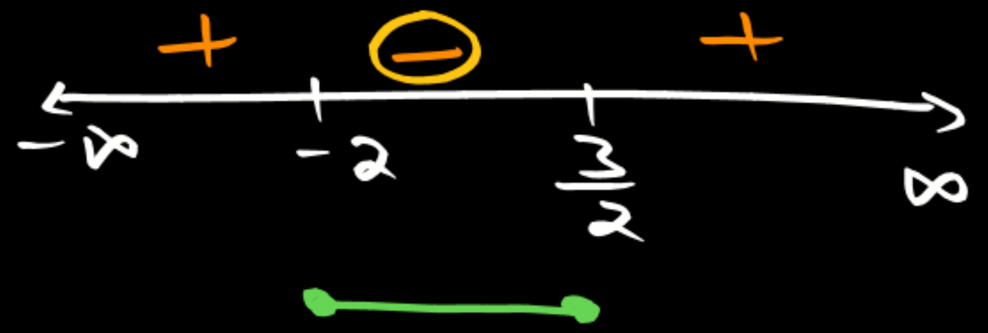
(4) Draw the no line & plot the critical points on the no line in Ascending order

(5) If all the above rules have been followed, Then Put alternately +ve & then -ve sign from the right side of the no line

$(x+2)\left(x-\frac{3}{2}\right) \leq 0 \longrightarrow$ -ve

Critical Points

$-2, \frac{3}{2}$



$x \in \left[-2, \frac{3}{2}\right]$

⑥ Based on the inequality sign in the last step before no line, consider the interval

① Solve

$$(2x-3)(5-3x)(x+2) \le 0$$

$$2\left(x-\frac{3}{2}\right)\left[-3\left(x-\frac{5}{3}\right)\right](x+2) \le 0$$

$$-6\left(x-\frac{3}{2}\right)\left(x-\frac{5}{3}\right)(x+2) \le 0$$

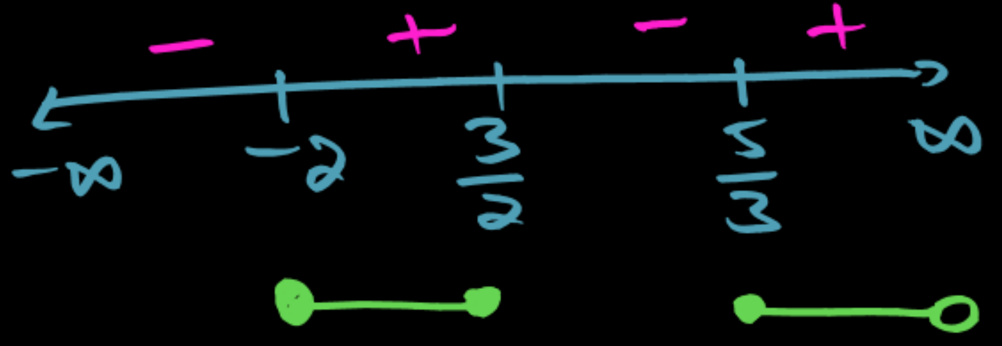
÷ by -6

$$\left(x-\frac{3}{2}\right)\left(x-\frac{5}{3}\right)(x+2) \ge 0$$

↳ +ve

Critical Points

$-2, \frac{3}{2}, \frac{5}{3}$



$$x \in \left[-2, \frac{3}{2}\right] \cup \left[\frac{5}{3}, \infty\right)$$

$\frac{3}{2} = 1.5$

$\frac{5}{3} = 1.66$

Actual method

$(x+2)(3-2x) \geq 0$

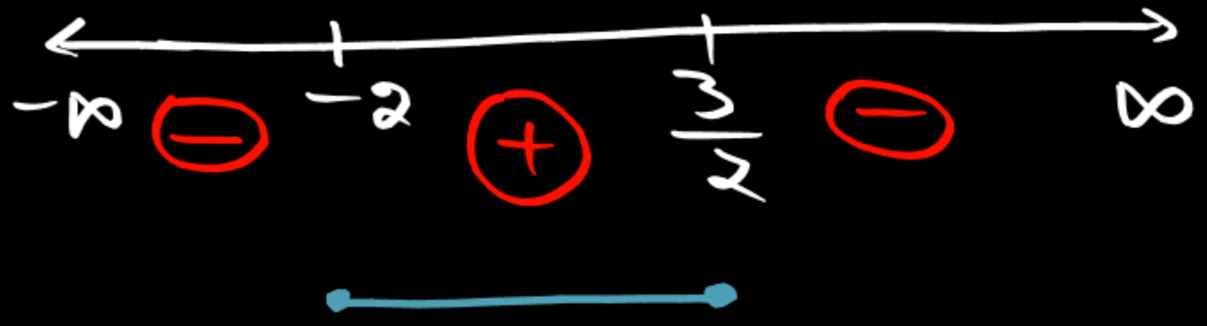
Critical Points

$x=-2$ and $x=\frac{3}{2}$

$\Downarrow$

Choose a check Point in each interval & substitute in the factor & see what is sign of the no.

	$x=-3$	$x=0$	$x=2$
$(x+2)$	$-$	$+$	$+$
$(3-2x)$	$+$	$+$	$-$



$x \in [-2, \frac{3}{2}]$

Solve

$$\frac{(x-2)(x+3)}{(5-x)(x-6)} \geq 0$$

Soln :-

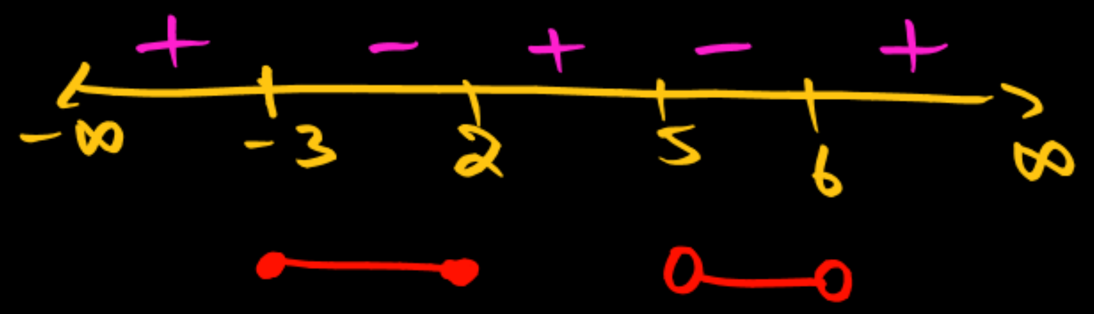
$$\frac{(x-2)(x+3)}{-(x-5)(x-6)} \geq 0$$

x'ly by (-1)

$$\frac{(x-2)(x+3)}{(x-5)(x-6)} \leq 0 \quad L,-ve$$

$D^r \neq 0$
$x \neq 5$
$x \neq 6$
in the
Ans

Critical Points
$-3, 2, 5, 6$



$x \in [-3, 2] \cup (5, 6)$

In open intervals the end points are not considered

Dangerous

↓

Lazy but Ambitious

(*) cross multiplication in an inequation is Possible

on if we know the sign of the expression

Ex:- solve

$$\frac{1}{x-2} < 3$$

wrong

$1 < 3(x-2)$

Since we donot know the sign of $(x-2)$

Right

$$\frac{1}{x-2} - 3 < 0$$

$$\frac{1-3(x-2)}{x-2} < 0$$

$$\frac{1-3x+6}{x-2} < 0$$

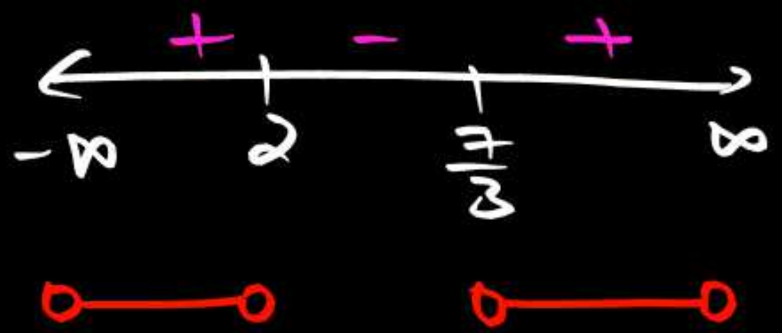
$$\frac{-3x+7}{x-2} < 0$$

$$\frac{-3\left(x-\frac{7}{3}\right)}{x-2} < 0$$

$\div$ by (-3)

$$\frac{x-\frac{7}{3}}{x-2} > 0$$

$$\frac{x-\frac{7}{3}}{x-2} > 0$$



$$x \in (-\infty, 2) \cup \left(\frac{7}{3}, \infty\right)$$

(2) $\frac{1}{|x-2|} < 3$

mod func

WKT $|x-2|$ is always +ve

$\therefore$ cross multiplication is possible

$1 < 3|x-2|$

$3|x-2| > 1$

$|x-2| > \frac{1}{3}$

$x-2 \in \left(-\infty, -\frac{1}{3}\right) \cup \left(\frac{1}{3}, \infty\right)$

Add 2 to get only x

$x \in \left(-\infty, 2-\frac{1}{3}\right) \cup \left(2+\frac{1}{3}, \infty\right)$

$x \in \left(-\infty, \frac{5}{3}\right) \cup \left(\frac{7}{3}, \infty\right)$

$|x| > a$

$x \in (-\infty, -a) \cup (a, \infty)$

⊛ logarithmic func :-

if $f(x) = \log_{h(x)} g(x)$

① $g(x) > 0$

② $h(x) > 0$

③ $h(x) \neq 1$

Ex:- Find x

if $f(x) = \log_5 x+3$

$g(x) = x+3$ & $h(x) = 5$

$\hookrightarrow > 0$ & $\neq 1$

$\Downarrow$

$x+3 > 0$

$x > -3$

Ans

$x \in (-3, \infty)$

(2) $f(x) = \log_{x+2} 6$ Find x

soln:-

$g(x) = 6$ & $h(x) = x+2$

$\hookrightarrow > 0$

$x+2 > 0$ $\quad$ $x+2 \neq 1$

$x > -2$ $\quad$ $x \neq -1$

$x \in (-2, \infty) - \{-1\}$

$\Downarrow$

$x \in (-2, -1) \cup (-1, \infty)$

③ if $f(x) = \log_{x+2}{x+5}$ find x

$x+2 \neq 1$

$x \neq 1-2$

$x \neq -1$

Since you are dealing with 2 func

$\therefore$ we consider the intersection of soln

Soln:-

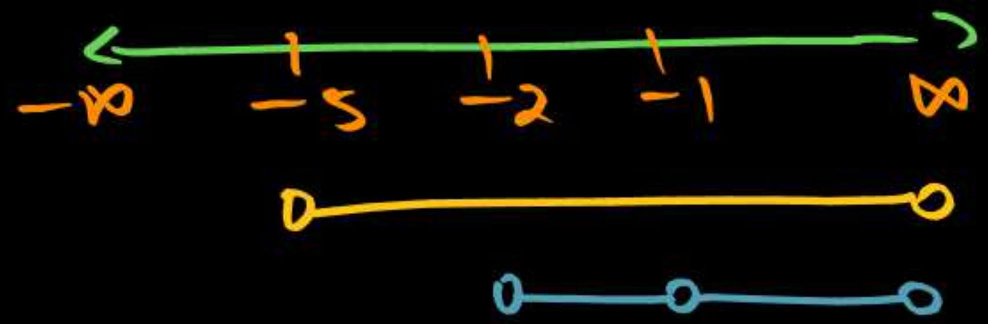
$x+5>0$	$x+2>0$	$x+2\neq 1$
$x>-5$	$x>-2$	$x\neq -1$
$x\in(-5,\infty)$		

$x\in(-2,-1)\cup(-1,\infty)$

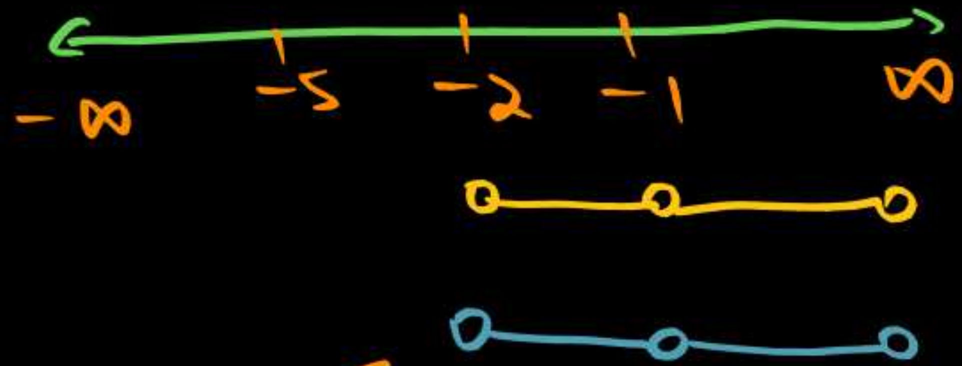
intersection

$x\in(-2,-1)\cup(-1,\infty)$ or $x\in(-2,\infty)-\{-1\}$

$x \in (-5, \infty)$



$x \in (-2, -1) \cup (-1, \infty)$



common

$x \in (-2, -1) \cup (-1, \infty)$

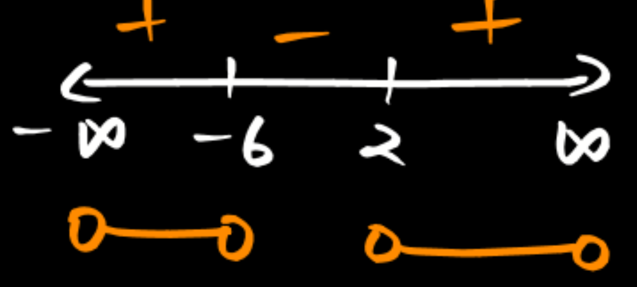
(2) if $f(x) = \log_{x+3} x^2+4x-12$ find x.

Soln:

$x^2+4x-12 > 0$

-12: $+6$, -2

$(x+6)(x-2) > 0$



$x \in (-\infty,-6) \cup (2,\infty)$

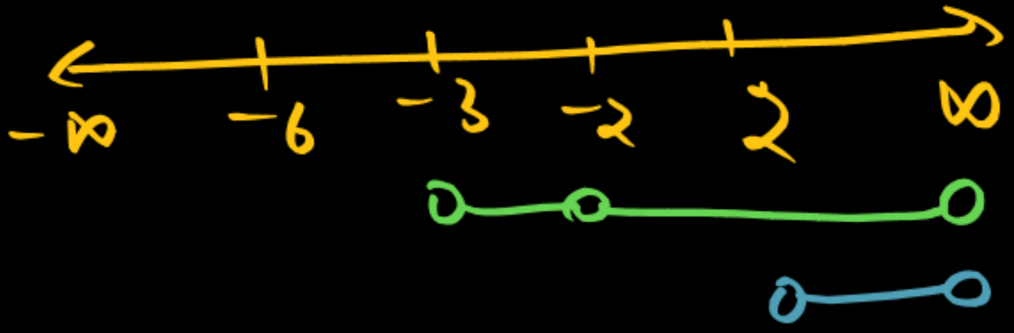
$x+3 > 0$

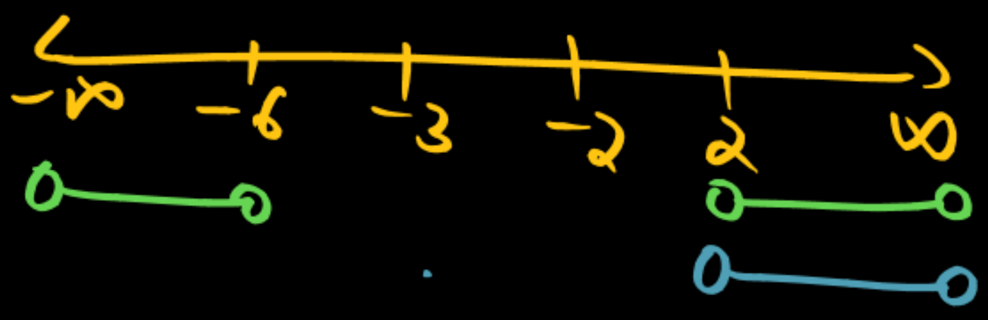
$x > -3$

$x+3 \neq 1$

$x \neq -2$

$x \in (-3,-2) \cup (-2,\infty)$





intersection

$x \in (2,\infty)$

* square root function :-

① If $f(x) = \sqrt{g(x)}$

$\Rightarrow g(x) \geq 0$

② If $f(x) = \dfrac{1}{\sqrt{g(x)}}$

$\Rightarrow g(x) > 0$

① if $f(x)=\sqrt{x-3}$ find x

Here

$x-3 \geqslant 0$

$x \geqslant 3$

$x \in [3, \infty)$

② if $f(x)=\frac{1}{\sqrt{5-x}}$

$\Rightarrow$ Here

$5-x > 0$

$5 > x$

$x < 5$

$x \in (-\infty, 5)$

(*) if $f(x) = g(x) + h(x)$

or

$f(x) = g(x) - h(x)$

or

$f(x) = g(x) \cdot h(x)$

or

$f(x) = \dfrac{g(x)}{h(x)}$

In all these cases

Domain of f = Domain of g

intersection

Domain of h

① if $f(x) = \dfrac{1}{\log_2 x-3} + \sqrt{x+5}$ find x

$$\frac{1}{\log_B A} = \log_A B$$

Soln:

$f(x) = \log_{x-3} 2 + \sqrt{x+5}$

$x-3>0$	$x-3 \neq 1$	$x+5 \geq 0$
$x>3$	$x \neq 4$	$x \geq -5$
		$x \in [-5, \infty)$

$x \in (3,4) \cup (4,\infty)$

intersection

$x \in (3,4) \cup (4,\infty)$

QUESTION

The domain of the function $f(x) = \frac{1}{\sqrt{9-x^2}}$ is

(A) $-3 \leq x \leq 3$

(B) $-3 < x < 3$

(C) $-9 \leq x \leq 9$

(D) $-9 < x < 9$

$9 - x^2 > 0$

$9 > x^2$

$x^2 < 9$

$\sqrt{x^2} < \sqrt{9}$

$|x| < 3$

$x \in (-3, 3)$

$\sqrt{x^2} = |x|$

$|x| < a$

$x \in (-a, a)$

(1) Domain of $f(x) = \frac{1}{\sqrt{x^2-16}}$

Soln.:

Here $x^2 - 16 > 0$

$$x^2 > 16$$

$$\sqrt{x^2} > \sqrt{16}$$

$$|x| > 4$$

$$x \in (-\infty, -4) \cup (4, \infty)$$

$|x| > a$

$x \in (-\infty, -a) \cup (a, \infty)$

QUESTION

The domain of the function $f(x) = \log_{3+x}(x^2 - 1)$ is

A $(-3, -1) \cup (1, \infty)$

B $[-3, -1) \cup [1, \infty)$

C $(-3, -2) \cup (-2, -1) \cup (1, \infty)$

D $[-3, -2) \cup (-2, -1) \cup [1, \infty)$

$x^2 - 1 > 0$

$x^2 > 1$

$\sqrt{x^2} > 1$

$|x| > 1$

$x \in (-\infty, -1) \cup (1, \infty)$

$3 + x > 0$

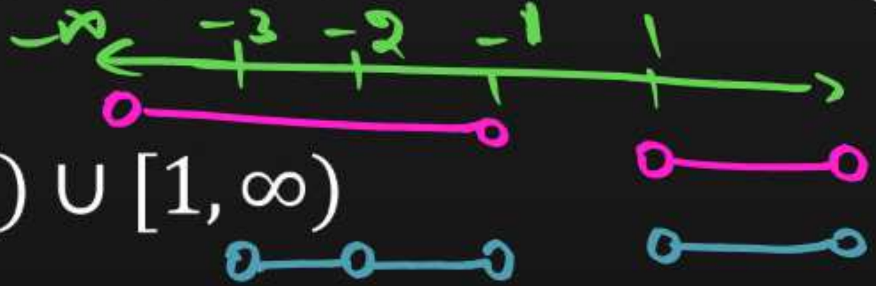
$x > -3$

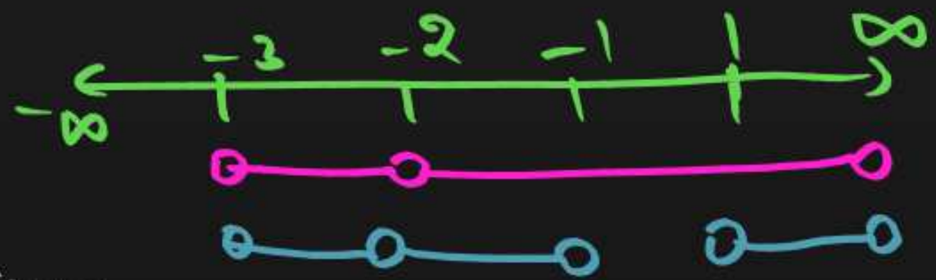
$x \in (-3, \infty)$

$3 + x \neq 1$

$x \neq -2$

$x \in (-3, -2) \cup (-2, \infty)$





intersection

$(-3, -2) \cup (-2, -1) \cup (1, \infty)$

QUESTION

The domain of the function $y = \sqrt{x-2} + \sqrt{1-x}$ is

$x - 2 \geq 0$

$x \geq 2$

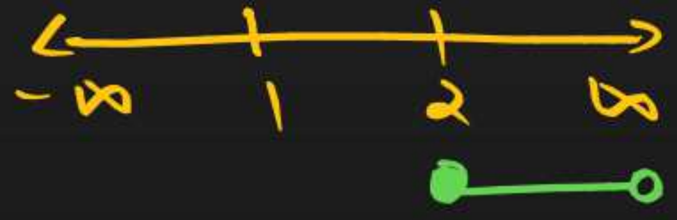
$x \in [2, \infty)$

$1 - x \geq 0$

$1 \geq x$

$x \leq 1$

$x \in (-\infty, 1]$



intersection

$\Downarrow$

empty

$\Downarrow$

No solution

(A) $x \leq 2$

(B) $x \geq 2$

(C) Null set

(D) The set of all numbers

QUESTION

The domain of the function f defined by $f(x) = \log_x 10$ is

$f(x) = \log_{h(x)} g(x)$

$x > 0$ & $x \neq 1$

① $g(x) > 0$

② $h(x) > 0$

③ $h(x) \neq 1$

(A) $x > 10$

(B) $x > 0$ excluding $x = 10$

(C) $x \geq 0$

(D) $x > 0$ $\underbrace{\text{excluding } x = 1}_{x \neq 1}$

QUESTION

The domain of the function $f(x)=\sqrt{(2-x)(x-3)}$ is

(A) $(0,\infty)$

(B) $[0,\infty]$

(C) $[2,3]$

(D) $(2,3)$

$(2-x)(x-3)\geq 0$

$-(x-2)(x-3)\geq 0$

$\div$ by -1

$(x-2)(x-3)\leq 0 \rightarrow$ -ve sign

$x\in[2,3]$

QUESTION

Let $f(x) = 3e^{\sqrt{x^2-1}}\log(x-1)$. Then, $\mathrm{Dom}(f) = ?$

$x^2-1 \geq 0$ $\quad$ $x-1>0$

$f(x) = g(x)\cdot h(x)$

(A) $]-\infty, 1]$

(B) $[-1, \infty]$

(C) $]1, \infty[$

(D) $]-\infty, -1] \cup]1, \infty[$

$x^2-1 \geq 0$

$x^2 \geq 1$

$\sqrt{x^2} \geq 1$

$|x| \geq 1$

$x \in (-\infty, -1] \cup [1, \infty)$

$x-1>0$

$x>1$

$x \in (1, \infty)$

intersection

$x \in (1, \infty) =]1, \infty[$

① $|x| \le a$

$x \in [-a, a]$

② $|x| \ge a$

$x \in (-\infty, -a] \cup [a, \infty)$

③ $a \le |x| \le b$

$x \in [-b, -a] \cup [a, b]$

QUESTION

Let $f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$. Then, Dom$(f)$ = ?

$f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$

$x+2 \geq 0$

$x \geq -2$

$x \in [-2, \infty) \to ②$

$1-x > 0$ & $1-x \neq 1$

$1 > x$ | $x \neq 0$

$x < 1$

$(-\infty, 1) - \{0\} \to ①$

① ∩ ②

$[-2, 1) - \{0\}$

A. $]-\infty, 1[-\{0\}) \cup ([-2, \infty[) = (-\infty, 1) - \{0\} \cup [-2, \infty)$

B. $[-2, \infty[-\{0\} = [-2, \infty) - \{0\}$

C. $[-2,1[-\{0\} = [-2, 1) - \{0\}$

D. None of these

$(a,b) =]a,b[$

QUESTION

Let $f(x) = \log(1-x) + \sqrt{x^2-1}$. Then, Dom$(f) = ?$

$1 - x > 0$

$1 > x$

$x < 1$

$x \in (-\infty, 1)$

$x^2 - 1 \geq 0$

$x^2 \geq 1$

$|x| \geq 1$

$x \in (-\infty, -1] \cup [1, \infty)$

intersection

$x \in (-\infty, -1]$

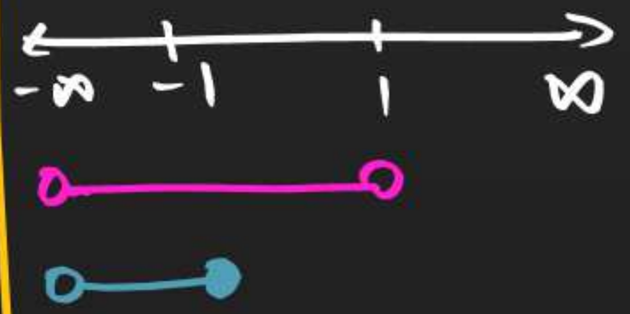
(A) $]1, \infty[$ — $(1, \infty)$

(B) $]-\infty, -1]$ — $(-\infty, -1]$

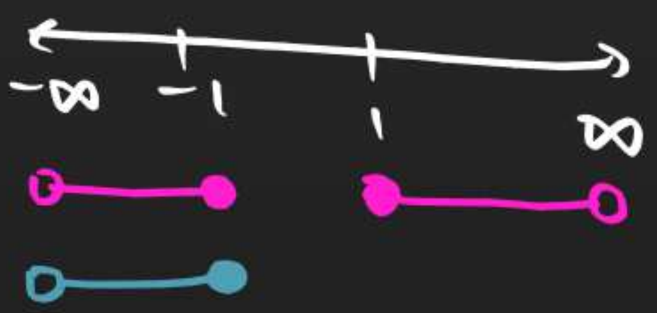
(C) $[-1, 1[$ — $[-1, 1)$

(D) $]0, 1[$ — $(0, 1)$

$x \in (-\infty, 1)$



$x \in (-\infty, -1] \cup [1, \infty)$



$|x| \geq a$

$x \in (-\infty, -a] \cup [a, \infty)$

QUESTION

Let $f(x) = \frac{1}{\sqrt{2x-1}} - \sqrt{1-x^2}$. Then, $\mathrm{Dom}(f) = ?$

(a, b)

$\hookrightarrow\ ]a, b[$

$\hookrightarrow$ open interval

$2x - 1 > 0$

$2x > 1$

$x > \frac{1}{2}$

$x \in \left(\frac{1}{2}, \infty\right)$

$1 - x^2 \geq 0$

$1 \geq x^2$

$x^2 \leq 1$

$|x| \leq 1$

$x \in [-1, 1]$

(A) $]1/2, 1] = \left(\frac{1}{2}, 1\right]$

(B) $[-1, \infty[\ = (-1, \infty)$

(C) $[1, \infty[\ = [1, \infty)$

(D) None of these

interpection

$x \in \left(\frac{1}{2}, 1\right]$

QUESTION

Let $f(x) = \frac{\sin^{-1} x}{x}$. Then, $\mathrm{Dom}(f) = ?$

$\sin^{-1} x \rightarrow x \in [-1,1]$

$x \rightarrow x \neq 0$

$\Rightarrow x \in [-1,1] - \{0\}$

(A) $]-1,1[\rightarrow (-1,1)$

(B) $]-1,1[-\{0\} \rightarrow (-1,1) - \{0\}$

(C) $[-1,1] - \{0\}$

(D) None of these

QUESTION

Let $f(x) = \cos^{-1}(3x-1)$. Then, $\mathrm{Dom}(f) = ?$

$$-1 \le 3x - 1 \le 1$$

$$0 \le 3x \le 2$$

$$0 \le x \le \frac{2}{3}$$

(A) $\left]0, \frac{2}{3}\right[$

(B) $\left[0, \frac{2}{3}\right]$

(C) $\left[-\frac{2}{3}, \frac{2}{3}\right]$

(D) None of these

QUESTION

For f to be a function, what is the domain of f, if $f(x)=\frac{1}{\sqrt{|x|-x}}$?

A $(-\infty, 0]$

B $(0, \infty)$

C $(-\infty, \infty)$

D $(-\infty, 0)$

$x=0$
$\Downarrow$
Not Possible
X

$x>0$

$x=3$

$f(x)=\frac{1}{\sqrt{3-3}}=\frac{1}{0}$

Does not exist
X

$x<0$

$x=-3$

$f(x)=\frac{1}{\sqrt{|-3|-(-3)}}=\frac{1}{\sqrt{3+3}}$

$=\frac{1}{\sqrt{6}}$ exist

$x\in(-\infty, 0)$

QUESTION

The domain of definition of $f(x)=\sqrt{\frac{1-|x|}{2-|x|}}$ is

(A) $(-\infty,-1] \cup [2,\infty)$

(B) $[-1,1] \cup (2,\infty) \cup (-\infty,-2)$

(C) $(-\infty,1) \cup (2,\infty)$

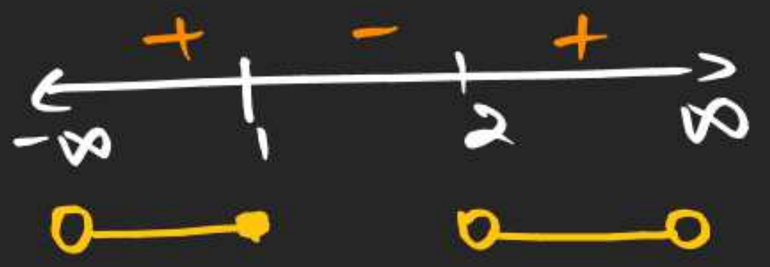
(D) $[-1,1] \cup (2,\infty)$.

Hint $|x| = t$

$f(x) = \sqrt{\frac{1-t}{2-t}}$

$\frac{1-t}{2-t} \geq 0$

$\frac{t-1}{t-2} \geq 0 \rightarrow t \neq 2$ in solution



$t \in (-\infty, 1] \cup (2,\infty)$

$|x| \in (-\infty, 1] \cup (2,\infty)$

$\Downarrow$ $\Downarrow$

$|x| \leq 1$ $\quad$ $2 < |x|$

$\Downarrow$ $\Downarrow$

$x \in [-1,1]$ $\quad$ $|x| > 2$

$\cup \rightarrow x \in (-\infty,-2) \cup (2,\infty)$

$x \in [-1,1] \cup (-\infty,-2) \cup (2,\infty)$

$$\frac{1-t}{2-t} \geq 0$$

$$\frac{\cancel{-}(t-1)}{\cancel{-}(t-2)} \geq 0$$

$$\frac{t-1}{t-2} \geq 0$$

QUESTION PYQ of KCET

The domain of $f(x) = \sqrt{\cos x}$ is

(A) $\left[0, \frac{\pi}{2}\right]$

(B) $\left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

(C) $\left[\frac{3\pi}{2}, 2\pi\right]$

(D) None of these

$\cos x \geq 0$

$\hookrightarrow$ +ve & 0

$\Downarrow$

$x \in 1^{st}$ & 4^{th} Quadrant

Anticlockwise $x \in \left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

or

Clockwise $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

(2) Domain of

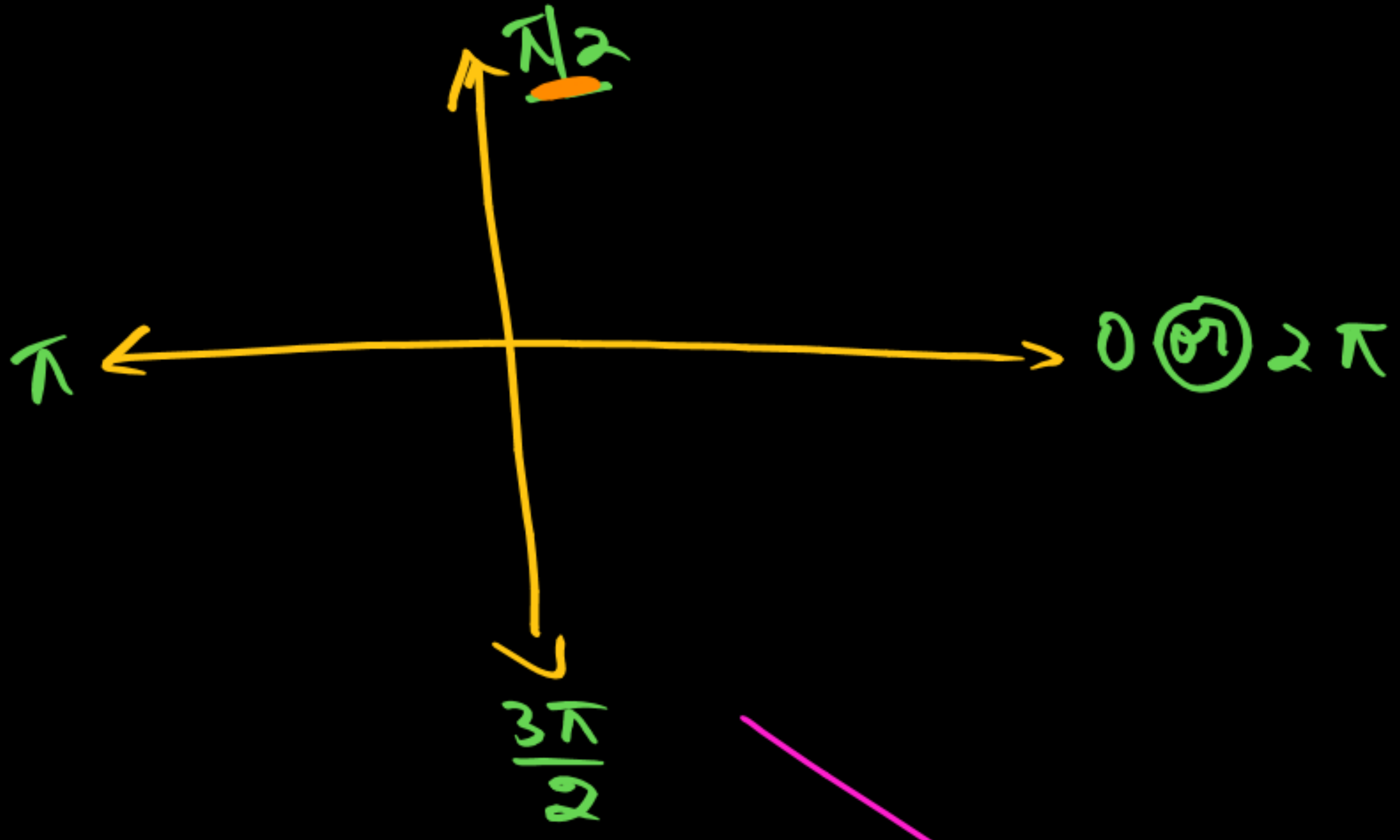
$f(x) = \frac{1}{\sqrt{\cos x}}$

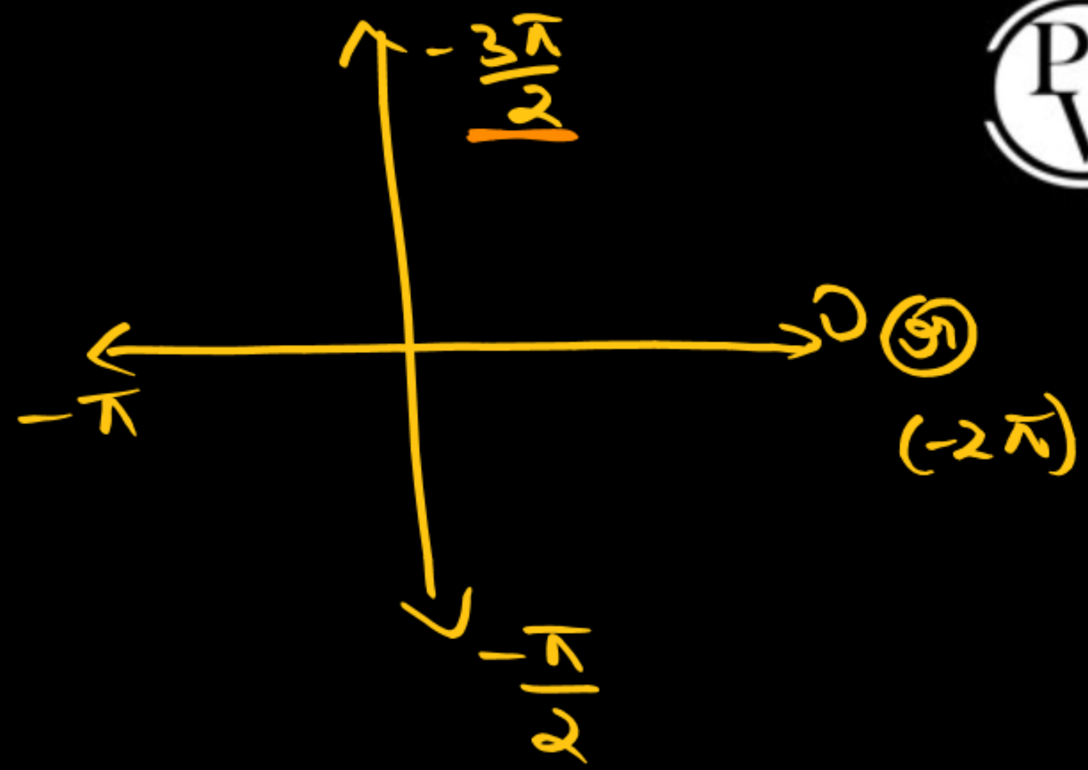
$\cos x > 0$ & $\cos x \neq 0$

only +ve

$x \in \left[0, \frac{\pi}{2}\right) \cup \left(\frac{3\pi}{2}, 2\pi\right]$

$x \neq \frac{\pi}{2}$ & $x \neq \frac{3\pi}{2}$



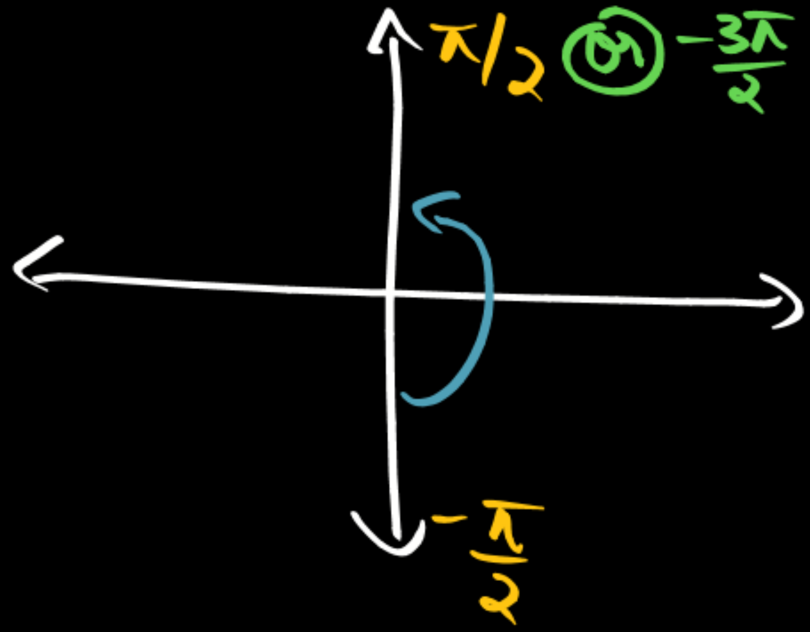


combine

$-\frac{3\pi}{2} < -\frac{\pi}{2}$

$[a, b]$

$a < b$



$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

या

$\left[-\frac{3\pi}{2}, -\frac{\pi}{2}\right]$

QUESTION

The domain of the function $f(x) = \sqrt{\sin x} + \sqrt{16 - x^2}$ is

$\Downarrow$ $\Downarrow$

$\sin x \geq 0$

$\Downarrow$

$x \in 1^{st}$ & 2^{nd} Quad

$x \in [0, \pi] \cup [-2\pi, -\pi]$

$x \in [0, 3.14] \cup [-6.28, -3.14]$

$16 - x^2 \geq 0$

$16 \geq x^2$

$x^2 \leq 16$

$|x| \leq 4$

$x \in [-4, 4]$

intersection

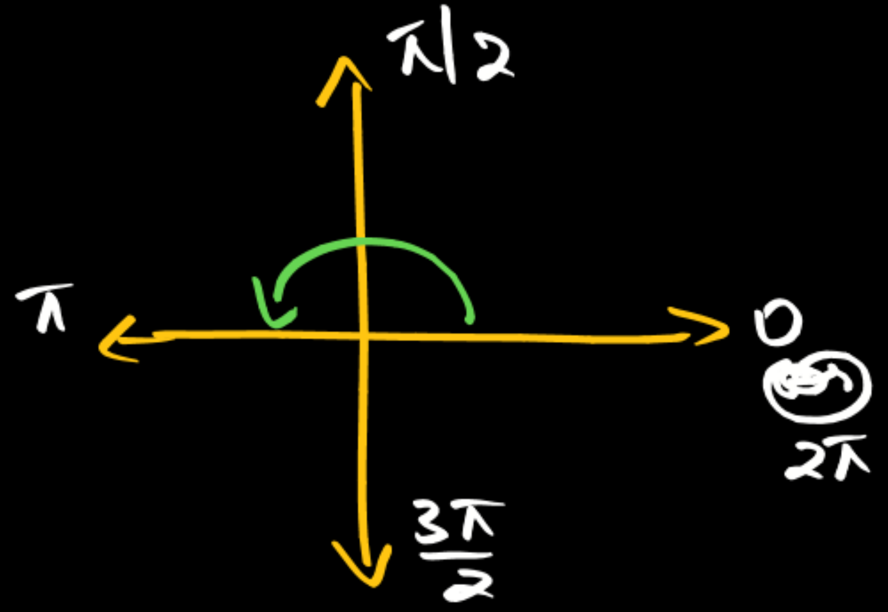
$x \in [-4, -3.14] \cup [0, 3.14] \Rightarrow x \in [-4, -\pi] \cup [0, \pi]$

(A) $[-4, 0) \cup (0, \pi]$

(B) $(-4, 4)$

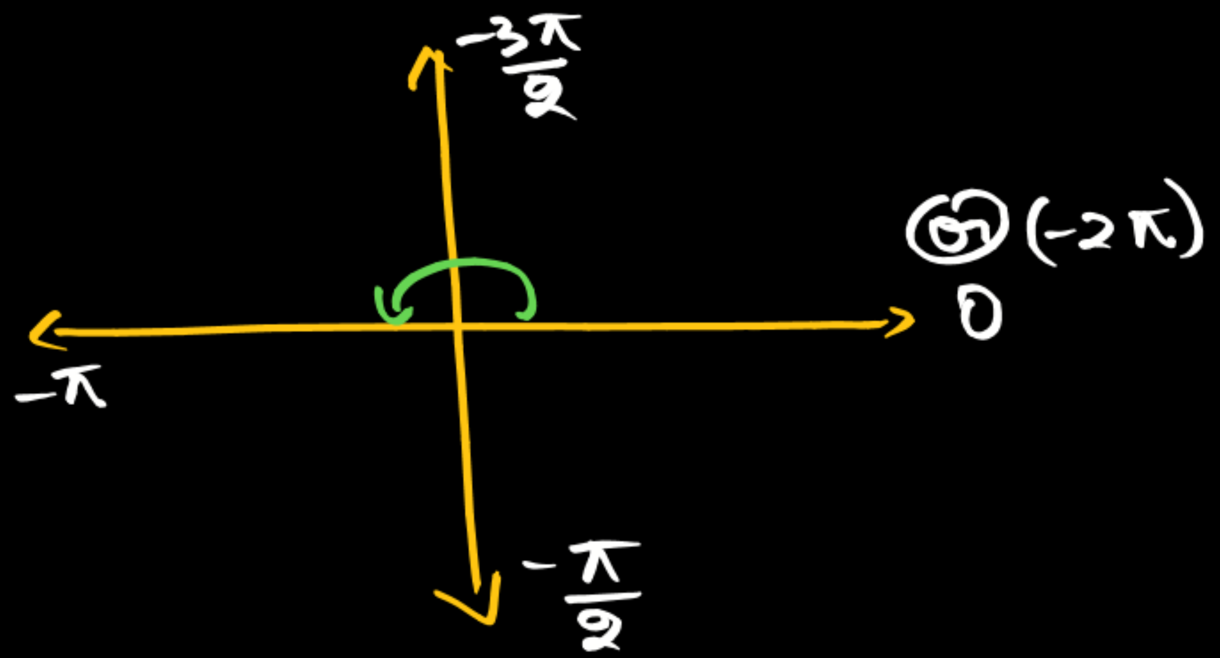
(C) $[-4, -\pi] \cup [0, \pi]$

(D) $[-4, \pi]$



Anticlockwise

$[0, \pi]$



Clockwise

$[-2\pi, -\pi]$

$\Downarrow$

$[a, b]$

$a < b$

QUESTION

The domain of the real valued function $f(x)=\sqrt{\frac{x-2}{3-x}}$ is

A [2,3]

B (2,3]

C [2,3)

D (2,3)

$$\frac{x-2}{3-x} \geq 0$$

$$\frac{x-2}{-(x-3)} \geq 0$$

x'ly by −1

$$\frac{x-2}{x-3} \leq 0$$

$x \neq 3$ in final solution

$+ \quad - \quad +$

$-\infty \quad 2 \quad 3 \quad \infty$

$x \in [2,3)$

QUESTION

If $|3x-2| \leq \frac{1}{2}$, then $x \in$

$$-\frac{1}{2} \leq 3x-2 \leq \frac{1}{2}$$

(A) $\left(\frac{1}{2}, \frac{5}{6}\right)$

$$-\frac{1}{2}+2 \leq 3x \leq \frac{1}{2}+2$$

(B) $\left[\frac{1}{2}, \frac{5}{6}\right)$

$$\frac{3}{2} \leq 3x \leq \frac{5}{2}$$

(C) $\left[\frac{1}{2}, \frac{5}{6}\right]$

$\div$ by 3

(D) $\left(\frac{1}{2}, \frac{5}{6}\right]$

$$\frac{1}{2} \leq x \leq \frac{5}{6}$$

QUESTION

Domain of the real valued function $f(x) = \frac{x+2}{9-x^2}$ is → Rational func

↓ $D^r \neq 0$

$9 - x^2 \neq 0$

$9 \neq x^2$

$\sqrt{x^2} \neq \sqrt{9}$

$|x| \neq 3$

$x \neq \pm 3$

$x \in R - \{-3, 3\}$

(A) R

(B) $R - \{3\}$

(C) $R - \{-3, 3\}$

(D) $-3 \leq x \leq 3$

(*) $f(x) = \frac{x+2}{\sqrt{9-x^2}}$

$9 - x^2 > 0$

$9 > x^2$

$x^2 < 9$

$\sqrt{x^2} < \sqrt{9}$

$|x| < 3$

$x \in (-3, 3)$

$\{-3, 3\}$

↓

set consisting of only elements -3 & 3

$(-3, 3) = \{x : -3 < x < 3, x \in R\}$

↳ set builder form

↓

set consisting of all the elements b/w -3 & 3

QUESTION

The domain of a function $f(y) = \frac{\cos^{-1}(y-5)}{\sqrt{25-y^2}}$ is

A (4,5]

B (4,6]

C (−5,5)

D [4,5)

$-1 \le y-5 \le 1$

$4 \le y \le 6$

$25 - y^2 > 0$

$25 > y^2$

$y^2 < 25$

$|y| < 5$

$y \in (-5,5)$

intersection

$[4,5)$

$f(\theta) = \sin^{-1}(\theta)$

$\theta \in [-1, 1]$

$f(\theta) = \cos^{-1}(\theta)$

$\theta \in [-1, 1]$

① Find the domain of $f(x) = \sin^{-1}(\underbrace{2x}_{\theta = 2x})$

Soln:-

$-1 \leq 2x \leq 1$

$\div$ by 2

$-\frac{1}{2} \leq x \leq \frac{1}{2}$

Domain $= \left[-\frac{1}{2}, \frac{1}{2}\right]$

(2) Find the domain of $f(x) = \cos^{-1}(x-3)$

Soln:

Here

$$-1 \le x-3 \le 1$$

$$-1+3 \le x \le 1+3$$

$$2 \le x \le 4$$

$$x \in [2, 4]$$

① $f(x) = \dfrac{1}{\sqrt{x+|x|}}$

$x + |x| > 0$

↳ split point is 0

Case 1:- $x > 0$

$|x| = x$

$x + x > 0$

$2x > 0$

$x > 0$

$x \in (0, \infty)$

Case 2:- $x < 0$

$|x| = -x$

$x - x > 0$

$0 > 0$

False

② $f(x) = \dfrac{1}{\sqrt{x-|x|}}$

$x - |x| > 0$

↳ split point is $x = 0$

Case 1:- $x > 0$

$|x| = x$

$x - x > 0$

$0 > 0$

False

Case 2:- $x < 0 \rightarrow$ ①

$|x| = -x$

$x - (-x) > 0$

$2x > 0$

$x > 0 \rightarrow$ ②

From ① & ②

Not Possible

NO solution

③ $f(x) = \dfrac{1}{\sqrt{|x|-x}}$

$|x| - x > 0$

Case 1:- $x > 0$

$|x| = x$

$x - x > 0$

$0 > 0$

False

Case 2:- $x < 0$.

$|x| = -x$

$-x - x > 0$

$-2x > 0$

$x < 0$

$x \in (-\infty, 0)$

④ $f(x) = \sqrt{x+|x|}$

$x = -3$

$f(x) = 0$

Soln:-

$x + |x| \geq 0$

Case 1:-	Case 2:-	Case 3:-
$x = 0$	$x > 0$	$x < 0 \rightarrow ①$
	$\lvert x\rvert = x$	$\lvert x\rvert = -x$
$0 + 0 \geq 0$	$x + x \geq 0$	$x - x \geq 0$
$0 \geq 0$	$2x \geq 0$	$0 \geq 0$
True	$x \geq 0$	True
$\Downarrow$	True	$\Downarrow$
$x = 0$	$x \in (0, \infty)$	$x \in (-\infty, 0)$

$x \in R$

⑤ $f(x) = \sqrt{|x| - x}$

$|x| - x \geq 0$

Case 1:-	Case 2:-	Case 3:-
$x = 0$	$x > 0$	$x < 0 \rightarrow ①$
$0 - 0 \geq 0$	$x - x \geq 0$	$-x - x \geq 0$
$0 \geq 0$	$0 \geq 0$	$-2x \geq 0$
True	True	$x \leq 0 \rightarrow ②$
		$\Downarrow$
		True

$x \in R$

⑥ $f(x) = \sqrt{x - |x|}$

$x - |x| \geq 0$

$\Downarrow$

$x \in [0, \infty)$

Ans

Case 3:- $x < 0 \rightarrow ①$

$|x| = -x$

$x - (-x) \geq 0$

$2x \geq 0$

$x \geq 0 \rightarrow ②$

From ① & ②

Not possible

$f(x) = \sqrt{x + |x|}$

Case 1: $x = 0$

$f(x) = \sqrt{0+0}$

$= \sqrt{0} = 0$

exists

Case 2: $x = +ve$

$x = 3$

$f(x) = \sqrt{3 + |3|}$

$= \sqrt{3+3} = \sqrt{6}$

exists

Case 3: $x = -ve$

$x = -3$

$f(x) = \sqrt{-3 + |-3|}$

$= \sqrt{-3+3} = \sqrt{0}$

exists

$x \in R$

$f(x) = \sqrt{x - |x|}$

$x = 0$

$f(x) = \sqrt{0 - 0}$

$= \sqrt{0}$

$= 0$

exists

$x = +ve$

$x = 3$

$f(x) = \sqrt{3 - |3|}$

$= \sqrt{3 - 3}$

$= \sqrt{0} = 0$

exists

$x = -ve$

$x = -3$

$f(x) = \sqrt{-3 - |-3|}$

$|-3| = 3$

$= \sqrt{-3 - 3}$

$= \sqrt{-6}$

Doesnot exist

X

$x \in [0, \infty)$

QUESTION

The domain of the function $f(x) = \frac{1}{\sqrt{x+|x|}}$ is

(A) $(-\infty, 0)$

(B) $(2,5)$

(C) $(0, \infty)$

(D) $(-\infty, \infty)$

QUESTION

The domain of the function $f(x) = \sqrt{x}$ is

A $R - \{0\}$

B $R^+ \cup \{0\}$

C R

D R^+

$x \geq 0$

$\Downarrow$

$R^+ \cup \{0\}$

$(0, \infty) \to R^+ \to$ set of +ve real nos

$R_* \to$ Set of real nos excluding zero

$[0, \infty) \to$ set of non negative real nos

QUESTION

The domain of the function $f(x)=\sqrt{x-1}+\sqrt{6-x}$ is

$\Downarrow$ $\qquad$ $\Downarrow$

$x-1\geq 0$ $\qquad$ $6-x\geq 0$

$x\geq 1$ $\qquad$ $6\geq x$

$x\in[1,\infty)$ $\qquad$ $x\leq 6$

$x\in(-\infty,6]$

intersection

$x\in[1,6]$

(A) $[1,\infty)$

(B) $[1,6]$

(C) $(-\infty,1)$

(D) $(6,\infty)$

QUESTION

If $f(x) = [8x] - 3$, where $[x]$ is greatest integer function of x, then $f(\pi) =$ (where $\pi = 3.14$)

$f(x) = [8x] - 3$

(A) 21

$f(\pi) = [8(\pi)] - 3$

(B) 25

$= [8(3.14)] - 3$

(C) 23

$= [25.12] - 3$

(D) 22 ✓

$= 25 - 3$

$= 22$

QUESTION

The domain of the function $\log_{10}(x^2 - 5x + 6)$ is

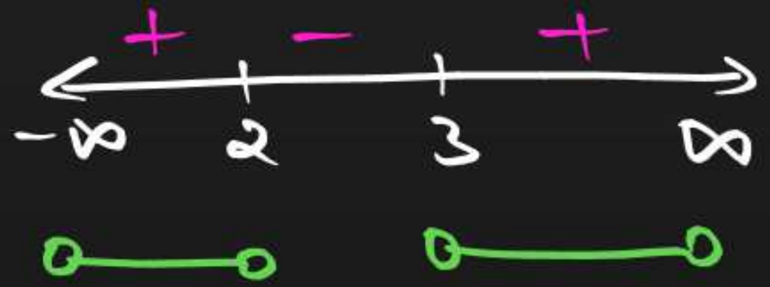
$x^2 - 5x - 6 > 0$

$-6 \to -6, +1$

$x^2 - 5x + 6 > 0$

$+6 \to -2, -3$

$(x-3)(x-2) > 0$



$x \in (-\infty, 2) \cup (3, \infty)$

A $(-\infty, \infty)$

B $(-\infty, 2) \cup (3, \infty)$

C (2,3)

D None of these

QUESTION

The domain of the definition of the function $f(x) = \frac{1}{4-x^2} + \log_{10}(x^3 - x)$ is

A $(-1,0) \cup (1,2) \cup (3,\infty)$

B $(-2,-1) \cup (-1,0) \cup (2,\infty)$

C $(-1,0) \cup (1,2) \cup (2,\infty)$

D $(1,2) \cup (2,\infty)$

$4 - x^2 \neq 0$

$4 \neq x^2$

$\sqrt{x^2} \neq \sqrt{4}$

$|x| \neq 2$

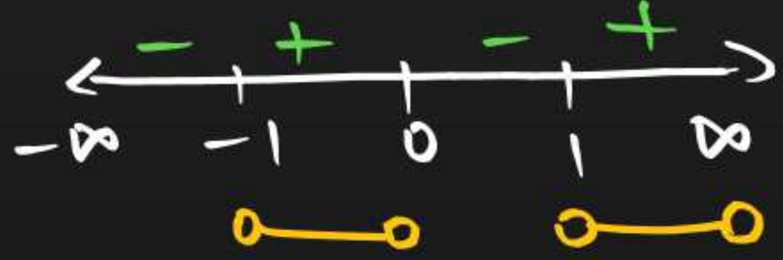
$x \neq \pm 2$

$x \in (-\infty,-2) \cup (-2,2) \cup (2,\infty)$

$x^3 - x > 0$

$x(x^2-1) > 0$

$x(x+1)(x-1) > 0$



$x \in (-1,0) \cup (1,\infty)$

intersection.

$x \in (-1,0) \cup (1,2) \cup (2,\infty)$

QUESTION

If $[x]$ is greatest integer function and $2[2x-5]-1=7$, then x lies in

(A) $\left[\frac{9}{2}, 5\right]$

(B) $\left(\frac{9}{2}, 5\right)$

(C) $\left[\frac{9}{2}, 5\right)$

(D) $\left(\frac{9}{2}, 5\right]$

Put $2x-5=t$

$2[t]-1=7$

$2[t]=8$

$[t]=4$

$t\in[4,5)$

$2x-5\in[4,5)$

$4\le 2x-5<5$

Add 5

$9\le 2x<10$

$\frac{9}{2}\le x<5$

$x\in\left[\frac{9}{2}, 5\right)$

$$[t] = 4 \quad \Downarrow \quad t \in [4, 5)$$

to get output as 4

The input we put are the values from 4 upto 5 find Domain

$$f(x) = \frac{1}{x+3}$$

Domain $= R - \{-3\}$

$x + 3 \neq 0$

$x \neq -3$

$$f(x) = \frac{1}{g(x)}$$

$g(x) \neq 0$

② $f(x) = \dfrac{1}{x^2+3x+2}$ find Domain

Here

$x^2+3x+2 \neq 0$

$+2$

$+2 + 1$

$(x+2)(x+1) \neq 0$

$x \neq -2$ & $x \neq -1$

$x \in R - \{-2, -1\}$

QUESTION

The domain of definition of $f(x) = \frac{\log_2(x+3)}{x^2+3x+2}$ is

(A) $R - \{1,2\}$

(B) $(-2, \infty)$

(C) $R - \{-1,-2,-3\}$

(D) $(-3, \infty) - \{-1, -2\}$

$x+3>0$

$x>-3$

$x \in (-3, \infty)$

$x^2+3x+2 \neq 0$

$(x+2)(x+1) \neq 0$

$x \neq -2, -1$

$x \in R - \{-2,-1\} \Rightarrow x \in (-\infty,-2) \cup (-2,-1) \cup (-1,\infty)$

intersection

$x \in (-3, \infty) - \{-2,-1\} \Rightarrow (-3,-2) \cup (-2,-1) \cup (-1,\infty)$

Thank You