Nishant Jindal

Fundamentals of Mathematics

$[x] = 5$

$x \in [5, 6)$

$[x] = -7$

$x \in [-7, -6)$

Q $[\log_3 x] = 5$ then $x \in$?

$\log_3 x \in [5, 6)$

$5 \le \log_3 x < 6$

$3^5 \le x < 3^6$

$x \in [3^5, 3^6)$

Q No of Integer from $[7, 12)$?

$= 12 - 7$ Int.

$= 5$ Int

7, 8, 9, 10, 11

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Q (81, 243) No of Int?

243 − 81 = 162 Int.

$3^3 4771$

5

23855

Use of charactristic

➢ Mantissa is basically used to find No. of digits before Decimal & No of zeros After Decimal

Q No of Digits in 2^{100}?

take $\log_{10}$

$\log_{10} 2^{100}$

$= 100 \times \log_{10} 2$

$= 100 \times .3010$

$= 30.10$ → Ch = 30, Mant = .10

No of Digits = Ch + 1

= 30 + 1 = 31

Q No of digits in 3^{50}?

$\log_{10} 3^{50}$

$50 \log_{10} 3$

$50 \times .4771$

$= 23.855$ → Ch = 23, Mant = .855

No of Digit = 23 + 1

= 24

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Q No of digits in 6^{100}?

$\log_{10} 6^{100}$

$100 \log_{10} 6$

$100 \times \log_{10}(2\times3)$

$100 * (\log_{10}2 + \log_{10}3)$

$100 \times (.3010 + .4771)$

$100 \times (.7781)$

$= 77.81 - \begin{cases} \rightarrow Ch = 77 \\ \rightarrow Mant = .81 \end{cases}$

No of digit $= 77 + 1 = 78$

Fractional Part fxn.

(1) It is Rep. by $f(x) = \{x\}$

(2) It gives fractional Value of No.

$\{6.22\} = .22$

$\{4.031\} = .031$

$\{4\} = 0$

$\{-17\} = 0$

$\{\text{Integer}\} = 0$

$\{-6.22\} = 1 - .22 = .78$

$\{-4.013\} = 1 - .013$

$\{-16.29\} = 1 - .29$

$= .71$

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$\{-1.12\} = 1 - .12$

$= .88$

$\{-12\} = 0$

$\{4.28\} = .28$

No. of cyphers

No of Zero after Decimal before any significant digit is always $= |ch + 1|$

Q No of cyphers in 2^{-100}

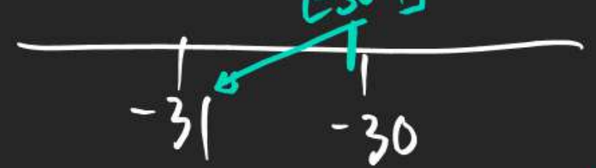
$\log_{10} 2^{-100}$

$-100 \times \log_{10} 2$

$-100 \times .3010$

$= -30.10$

$(har = [-30.10] = -31$



No of zeroes $= |-31 + 1|$

$= |-30| = 30$

Q No of zeroes in $\left(\frac{2}{3}\right)^{100}$?

$\log_{10} \left(\frac{2}{3}\right)^{100}$

$= 100 \times \log \frac{2}{3}$

$= 100 (\log_{10} 2 - \log_{10} 3)$

$= 100 (.3010 - .4771)$

$= 100 \times (-.1761)$

$= -17.61$

$ch = [-17.61] = -18$

No of zeroes $= |-18 + 1| = 17$

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Q Given that $\log_3 N = \alpha + \beta$ where $\beta \in [0,1)$ → ① Smj Jaya Ki β = Mantissa.

Now find No of Integers in N if $\alpha = 4$ ② Yha α = Characteristic.

$\alpha = 4 \Rightarrow Ch = 4$

$[\log_3 N] = 4$

$\log_3 N \in [4,5)$

$4 \le \log_3 N < 5$

$3^4 \le N < 3^5$

$81 \le N < 243$

No of Integer in N

$= 243 - 81$

$= 162$

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Q Given that $\log_5 N = \alpha + \beta$; $\beta \in [0,1)$

Now find the No of Integral values of N

if $\alpha = 3$.

$\alpha = 3$ = characteristic

$[\log_5 N] = 3$

$\log_5 N \in [3,4)$

$3 \le \log_5 N < 4$

$5^3 \le N < 5^4$

$125 \le N < 625 \Rightarrow N = 625 - 125 = 500$ Int.

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Modulus fxn / Absolute Value fxn

① $f(x) = |x|$ is Modulus fxn

② $|-2| = -(-2) = 2$

$$|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

$$|2x-1| = \begin{cases} (2x-1) & 2x-1 \geq 0 \\ -(2x-1) & 2x-1 < 0 \end{cases}$$

Aur Better.

$$|2x-1| = \begin{cases} (2x-1) & x \geq \frac{1}{2} \\ -(2x-1) & x < \frac{1}{2} \end{cases}$$

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$$|7x-4| = \begin{cases} (7x-4) & 7x-4 \geq 0 \\ -(7x-4) & 7x-4 < 0 \end{cases}$$

$$|7x-4| = \begin{cases} (7x-4) & x \geq \frac{4}{7} \\ -(7x-4) & x < \frac{4}{7} \end{cases}$$

Q Find x if $|x| = 3$

$x = \pm 3$ //

$|3| = 3$

$|-3| = -(-3) = 3$

Q If $|4x-1| = 3$ then $x = ?$

$4x-1 = \pm 3$

$4x-1 = 3$ OR $4x-1 = -3$

$4x = 4$ $\quad$ $4x = -3+1$

$x = 1$ $\quad$ $4x = -2$

$x = -1/2$

$x = -1/2, 1$

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Q $|2x+3|=5$ find x?

$2x+3=\pm 5$

$2x+3=5$ or $2x+3=-5$

$2x=2$ $\quad 2x=-8$

$x=1$ $\quad x=-4$

$x=1,-4$

Q find value of $|x-2|$ when $x<2$

$|x-2|=-(x-2)$

$=2-x$

$x=1.9$ (Assume)

$|1.9-2|$

$|-ve|$

Q find value of $|x+5|$ when $x\geq -5$

$|x+5|=x+5$

$x=-4$

$|-4+5|$

$|+ve|$

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Q Find value of $|4x-3|$ When $x<\frac{3}{4}$

$|4x-3| = -(4x-3)$

$= 3-4x$

$x=0$
$\|4\times0-3\|$
$\|0-3\|$
$\|-ve\|$

Q Find value of $y=|x+3|+|x-3|$

When $x \geq 2$

$y = (x+3)-(x-3)$

$y = 6$

$x \geq 2$
$x = 2.1$
$[2,3]$
$\|2.1+3\|+\|2.1-3\|$
$\|+ve\|+\|-ve\|$

Q Find value of $y=|x+2|+|x-2|$ When $x \geq 2$

$y = (x+2)+(x-2)$

$y = 2x$

$x \geq 2$
$x = 3$
$\|3+2\|+\|3-2\|$
$\oplus \quad \oplus$

If $x \geq 3$

$x = 4$

$|4+3|+|4-3|$

$\oplus \quad \oplus$

$y = |x+3|+|x-3|$

$= x+3+x-3$

$y = 2x$

$|4+3|+|4-3|$

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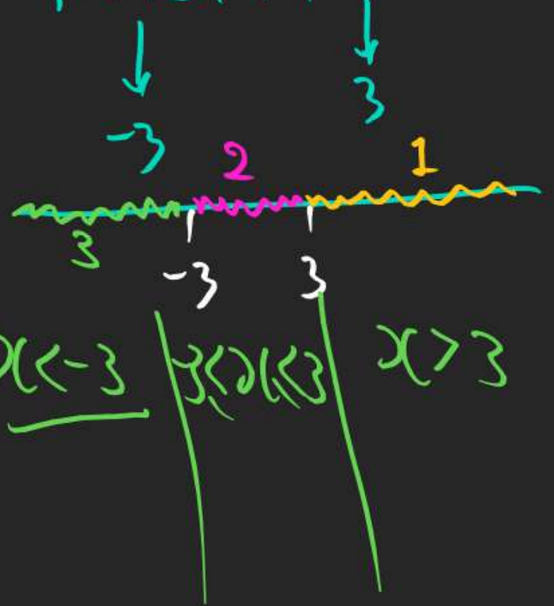
Q $y = |3x-4| + |5x+1|$ has (r.ht?

$3x-4=0$ | $5x+1=0$

$x = \frac{4}{3}$ | $x = -\frac{1}{5}$

Q $y = |x+3| + |x-3|$ has (r.ht?



$x<-3$ | $-3<x<3$ | $x>3$

Q $y = |x+2| + |x-3|$ has (r.hts

& Interval)

(r.ht = $-2, 3$

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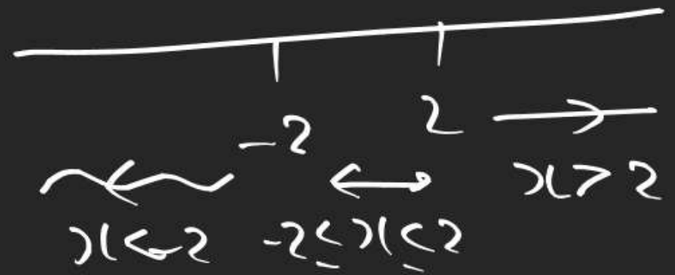
Q Solve $|x+2|+|x-2|=5$

$x = -2$ & 2



① When $x \geq 2$ → $x=2.1$

$|2.1+2|+|2.1-2|$

(+) (+)

$(x+2)+(x-2)=5$ ✓

$2x=5 \Rightarrow x=\frac{5}{2}=2.5$

② When $-2 \leq x \leq 2$ → $x=1$

$x+2-(x-2)=5$

$4=5$

ϕ

$|1+2|+|1-2|$

(+) (−)

③ When $x<-2$ → $x=-2.1$

$-(x+2)-(x-2)=5$

$-2x=5$

$x=-\frac{5}{2}=-2.5$ ✓

$|-2.1+2|+|-2.1-2|$

(−) (−)

$x = \frac{5}{2}, -\frac{5}{2}$

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Q $|x+3|+|x-2|=7$ Solve

① When $x<-3$

$-(x+3)-(x-2)=7$

$-2x=8$

$x=-4$ ✓

$x=-3.1$

$|-3.1+3|+|-3.1-2|$

$\ominus \quad \ominus$

② When $-3\le x\le 2$

$(x+3)-(x-2)=7$

$5=7$

$\oplus \quad \phi$

$x=-2.5$

$|-2.5+3|+|-2.5-2|$

$\oplus \quad \ominus$

③ $x>2$ ✓

$x+3+(x-2)=7$

$2x=6$

$x=3$

$x=2.1$

$|2.1+3|+|2.1-2|$

$\oplus \quad \oplus$

$x=3,-4$

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Q If $|x+1| = -4$ find $x = ?$

$|x+1| = -4$

≥ 0 (+) $\neq$ -ve

ϕ

Q Find value of x satisfying $|x-4| + |x-3| = 7$

Q ——— $|x-1| + |x-3| = 4$

Q ——— $|2x-1| + |x| = 3$.