

$$\underline{165} : 4 \cdot 3^x - 1 = 3^{2x+1} = 3 \cdot 3^{2x}$$

$$(t+4)(t+2) - 21(t-1)(t+2) + 10(t-1)(t+4) = 0 \\ (t+1)(t-1) > 0 \Rightarrow t = 1, 3$$

$$\log_2 x = 0 \Rightarrow x = 1$$

$$\log_2 \left((\log_2 x + 2)^2 + (2\log_2 x - 3) \right) = 8$$

$$\underline{63} : \frac{2\log_2 x}{\log_2 x - 1} - \frac{14(3\log_2 x)}{\log_2 x + 4} + \frac{20\log_2 x}{\log_2 x + 2} \geq 0$$

$$\underline{174} \quad \left(\frac{4 \cdot 3^x - 6}{9^x - 6} \right) = 2$$

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

$$4t - 6 = 2(t^2 - 6)$$

$$\underline{175} \quad \log_{10}(5x-4) + \log_{10}(\sqrt{x+1})^2 = \log_{10}(100 \times 0.18)$$

$$\underline{6} \quad 2 \cdot 5^{x-2} - 1 = 5^{2x-4} \quad (5x-4)(x+1) = 18$$

$$5x^2 + x - 22 = 0 = (5x+11)(x-2)$$

$$2t - 1 = t^2$$

-10 + 11

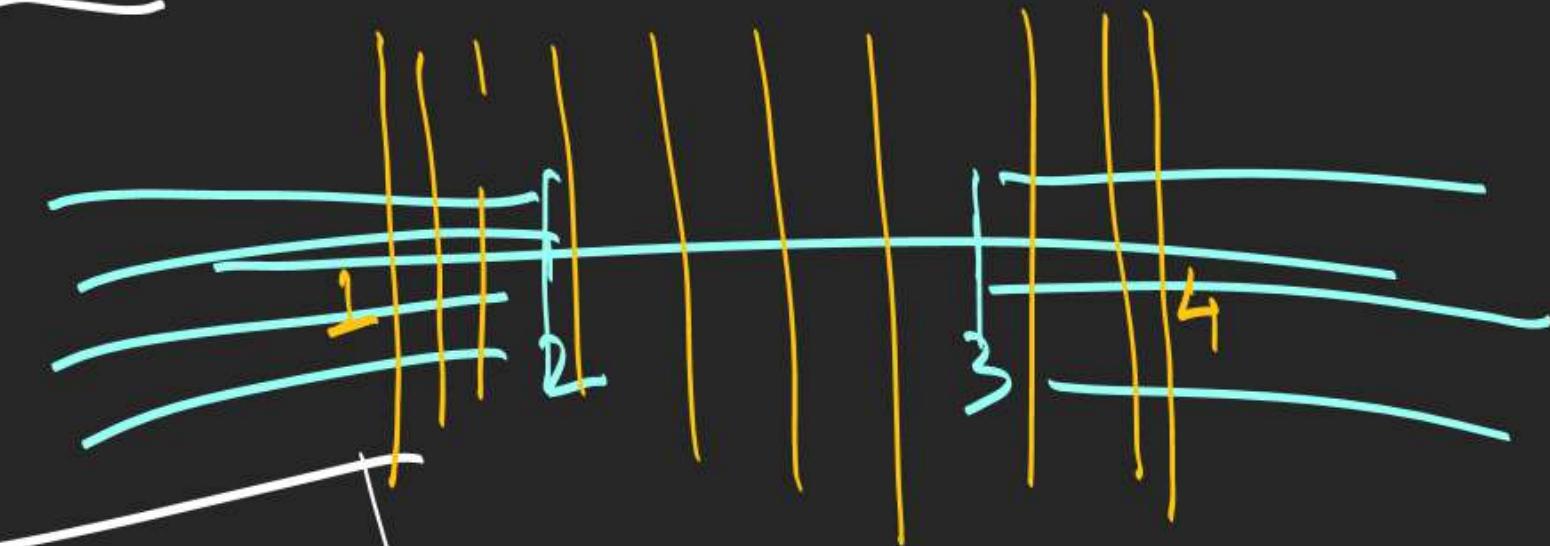
$$x = \left(\begin{array}{c} -1 \\ \hline 5 \end{array} \right), 2$$

reject

$$66. \quad -\gamma - \overline{\gamma} - \overline{\gamma} - \overline{\gamma} - \overline{\gamma} - \overline{\gamma} \\ 0 < x^2 - 5x + 6 < 2$$

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

$$x \in (1, 4)$$



$$x \in (1, 2) \cup (3, 4) \Rightarrow A \in \mathbb{R}$$

$$\begin{aligned} (x-5)^2 &+ 7 - 25 \\ &= (x-5)^2 + 3 > 0 \end{aligned} \quad \begin{aligned} 0 &< x^2 - 5x + 6 < 2 \\ x^2 - 5x + 7 &< 0 \end{aligned} \quad \begin{aligned} x \in (2, 3) &\Rightarrow A \in \mathbb{R} \end{aligned}$$

$$\begin{aligned} & 4(\cos^3 \theta - \sin^3 \theta) - 3(\cos \theta - \sin \theta) = a \\ & b \left(4 \left(1 + \frac{\sin \theta \cos \theta}{2} \right) - 3 \right) = a \\ & b \left(1 + 2 \left(1 - (\cos \theta - \sin \theta)^2 \right) \right) = a \\ & b(3 - 2b^2) = a \end{aligned}$$

$$\begin{aligned} & 2 \sin \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right) = a \\ & 2 \cos \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right) = b \\ & a^2 + b^2 = 4 \cos^2 \left(\frac{x+y}{2} \right) = c \\ & \frac{2 \sin(x+y)}{2 \cos x \cos y} \\ & \frac{2 \sin(x+y)}{\cos(x+y) + \cos(x-y)} = c \\ & 2 \left(\frac{2ab}{1 + 2b^2 + a^2} \right) = c \\ & \frac{1 - 2b^2}{1 + 2b^2} = c \end{aligned}$$

Characteristic & Mantissa

$$\log_a b = I + F \quad \overbrace{\pi}^{\downarrow} = 3 + (\pi - 3) \quad \begin{matrix} \downarrow \\ I \\ \downarrow \\ F \end{matrix}$$

I is an integer & $0 \leq F < 1$

I = Characteristic of $\log_a b$ to base a

$$-13.685 = -14 + 0.315$$

F = Mantissa of $\log_a b$ to base a

$$(-13) + \underbrace{(-0.685)}_{\in (-1, 0)}$$

$$\log_a b = \underline{1}43 \cdot 8987$$

$$\text{Char.} = 143$$

$$\text{Mantissa} = 0.8987$$

$$\log_a b = -13.685 = \overline{14} \cdot 315$$

$$\text{Ch} = -14 \\ \text{Mantissa} = 0.315$$

1. Find N if characteristic of $\log_5 N$ to base 5 is 3

$$\log_5 N = \text{Ch.} + \text{Mant.}$$

$N \in [125, 625)$

127.012

$$\begin{aligned} & \log_5 3 \leq \log_5 N < \log_5 4 \\ & 3 \leq \log_5 N < 4 \end{aligned}$$

$0 \leq M < 1$

no. of integral values of N
 $= 625 - 125$

i. Use $\log_{10} 2 = 0.301$ and $\log_{10} 3 = 0.4771$,

find the number of digits in

$$(i) \boxed{6^{50}}$$

$$(ii) 3^{12} \times 2^8$$

$$\boxed{10^{38} \times 1.12 \times 10}$$

Ans $\rightarrow 39$

$$N = 6^{50}$$

$$\log_{10} N = 50 \log_{10} 6 = 50(0.301 + 0.4771) = 50 \times 0.7781$$

$$N = \frac{38.905}{10} = \frac{38+0.905}{10} \quad 0 < 0.905 < 1$$

$$10^{-1} < 10^{0.905} < 10^1$$

$$\boxed{1 < 10^{0.905} < 10}$$

$$1.2 \times 10^3 = 1200$$

$$8.96 \times 10^3 = 8960$$

$$9.89 \times 10^3 = 9890$$

$$11.2 \times 10^3 = 11200$$

8.292893 × 10³
↓
Fin

$$N = 3^{12} 2^8$$

$$\log_{10} N = 12 \log_{10} 3 + 8 \log_{10} 2$$

$$= 8.1332$$
$$N = 10^8 \times 10^{0.1332}$$

$1 < N < 10$

$\log_{10} 2 = 0.301, \log_{10} 3 = 0.4771$

Q. Find the number of zeroes after decimal before a significant figure starts in

$$(i) \left(\frac{9}{8}\right)^{-100} = N$$

Answ → 5

$$\log_{10} N = -100 \left(2 \log_{10} 3 - 3 \log_{10} 2 \right) = -5.12 = -6 + 0.88$$

$$N = 10^{0.88} \times (10^{-6})$$

1 < 10 0.000001

$$(ii) 3^{-50}$$

$10^{-3} = \underline{\underline{0.001}}$

-3

$$2.5 \times 10^{-3}$$

0.0025

$$N = 3^{-50}$$

$$\log_{10} N = -50 \log_{10} 3 = -50 (0.477) \\ 21.00003087$$

Proficiency Test Logarithm

$\log_{10} 23 = -2.3855 \times 10$

$N = 10^{0.145} \times 10^{-24}$