Nishant Jindal

$$3t^2-8t+5=(3t-5)(t-1)$$

$$-3t-5t$$

$$(x-3)^2+(y+4)^2=25$$

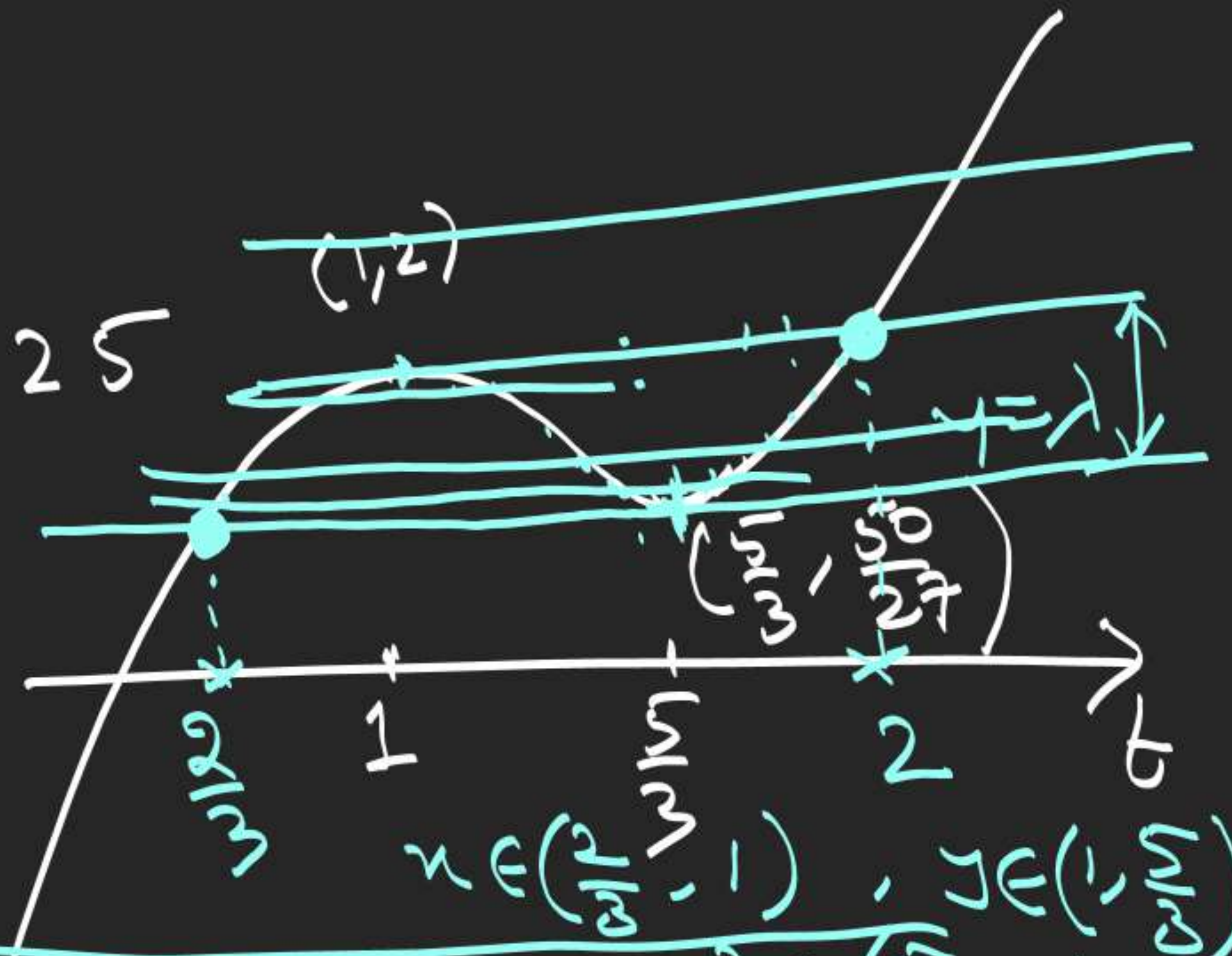
$$\le 25 \qquad \le 25$$

$$\boxed{x<y<z}$$

$$x+y+z=4$$

$$xy+yz+zx=\frac{16-6}{2}=5$$

$$x^2+y^2+(4-x-y)^2=6$$



$$x\in\left(\frac{2}{3},1\right),\ y\in\left(1,\frac{5}{3}\right)$$

$$z\in\left(\frac{5}{3},2\right)$$

$$f\left(\frac{5}{3}\right)=\frac{125}{27}-\frac{100}{9}+\frac{25}{3}$$

$$t^3-4t^2+5t-\lambda=0$$

$$=\frac{125-300+225}{27}$$

$$t^3-4t^2+5t=\lambda$$

$$=f(t)$$

$$f(t)=t^3\left(1-\frac{4}{t}+\frac{5}{t^2}\right)$$

$$f(t)\to-\infty$$

$$t\to-\infty,$$

$$2x^2+2y^2+2xy-8x-8y+10=0$$

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

$$x^2+y^2+xy-4x-4y+5=0$$

$$y^2+(x-4)y+x^2-4x+5=0$$

$$f\left(\frac{2}{3}\right)=\frac{8}{27}-\frac{16}{9}+\frac{10}{3}=\frac{50}{27}$$

$$D\ge 0 \qquad (x-4)^2-4(x^2-4x+5)\ge 0$$

$$x\in$$

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$\boxed{\text{Note: If } a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \dots a_1 x + a_0 = 0,\ \underset{i=0,1,\dots,n}{a_i \in R}, \text{ has imaginary root, then they exist in conjugate pair.}}$

$(-3,-1] \cup [3,5)$

$2-i$

$2+i$

$(x-p)^2 - 1 = (x-p-1)(x-p+1)$

$-2 < p+1 < 4$ & $p-1 \le -2$

or

$-2 < p-1 < 4$ & $p+1 \ge 4$

$p+1,\ p-1$

$p+1 < 4$

$p-1 < 4$

$\boxed{p \in (-\infty, 3)}$

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3. $\sqrt{x^2+4x-5} > x-3$

≥ 0 $\quad x^2+4x-5 \geq 0 \Rightarrow (-\infty,-5] \cup [1,\infty)$ ✓

$x-3 < 0$ OR $x-3 \geq 0$ ✓

$x^2+4x-5 > x^2-6x+9$

$10x > 14 \Rightarrow x > \frac{7}{5}$ ✓

$\boxed{x \in (-\infty,-5] \cup [1,3)}$ ✓ $\qquad \boxed{x \in [3,\infty)}$ ✓

$2^{x+2}(1-2-4) > 5^{-x+1}(1-5)$

$5 \cdot 2^{x+2} < 4 \cdot 5^{x+1}$ $\quad x \in (-\infty,-5] \cup [1,\infty)$

$\left(\frac{2}{5}\right)^x < 1 = \left(\frac{2}{5}\right)^0$

$\boxed{x > 0}$

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$$\boxed{0 \le x < 1 \;\&\; \boxed{2x - \frac{3}{4} > x^2} > 0}$$

OR

$$\boxed{x > 1 \;\&\; 0 < 2x - \frac{3}{4} < x^2}$$

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

$x^2 + 3x + 2 < 1 + x^2 - x + 1 + 2\sqrt{x^2 - x + 1}$

$2x \le \sqrt{x^2 - x + 1}$

$x \ge 0$ ✓

$x < 0$ ✓

$4x^2 < x^2 - x + 1$

$3x^2 + x - 1 < 0$

$$\boxed{(-\infty, -2] \cup [-1, 0)}$$ ✓

Nishant Jindal

α, β — $x^2-(a+1)x+a-1=0$ has integral roots

find integral values of a.

$(x-a)(x-1)=1$

$x-a=1$, $1=x-1$

$x-a=-1$, $-1=x-1$

$\Rightarrow$

$0=a-1$

$D=(a+1)^2-4(a-1)=k^2=(a-1)^2+4$

$k^2-(a-1)^2=4=(k-a+1)(k+a-1)$

$2 \quad -2$

$-2 \quad 2$

$2(a-1)=0$

$\boxed{a=1}$

$m-n$

$m+n=m-n+\boxed{2n}$

$\alpha+\beta=a+1$

$\alpha\beta=a-1$

$\alpha\beta-\alpha-\beta=-2$

$+1 \qquad +1$

$(\alpha-1)(\beta-1)=-1$

$1 \quad -1$

$-1 \quad 1$

Nishant Jindal

1: Find the sum of all integers between 1 to 1000 which are divisible by 2 or 3.

$$(2+4+6+\dots+998)+(3+9+15+\dots 999)$$

$$= \frac{499}{2}(2+998) + \frac{167}{2}(3+999) -$$

$$(2+4+\dots 998)+(3+6+9+\dots+999) - (6+12+18+\dots+996)$$

2: The sum of 'n' terms of two A.Ps are in the ratio $7n+1 : 4n+27$. Find the ratio of their 11^{th} terms

$$\frac{a_1+10d_1}{a_2+10d_2} = \frac{7(21)+1}{4(21)+27} = \frac{148}{111} = \frac{4}{3}$$

$$\frac{a_1+10d_1}{a_2+10d_2} = ? \quad \frac{\frac{n}{2}(2a_1+(n-1)d_1)}{\frac{n}{2}(2a_2+(n-1)d_2)} = \boxed{\frac{7n+1}{4n+27} = \frac{a_1+\frac{(n-1)}{2}d_1}{a_2+\frac{(n-1)}{2}d_2}}$$

Put $n=21$

$$\boxed{\frac{n-1}{2}=10}$$

$n=21$

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$-2a, -2b, -2c \rightarrow A.P.$

3. If a, b, c are in A.P., then P.T.

$-a, -b, -c \rightarrow A.P.$

$a+b+c-a,\ a+b+c-b,\ a+b+c-c$

(i) $b+c,\ c+a,\ a+b$ are in A.P.

$=(a+b+c)-a$

(ii) $(b+c)^2-a^2,\ (c+a)^2-b^2,\ (a+b)^2-c^2$ are in A.P.

$(b+c-a)(b+c+a),$

$a+b+c-2b,\ a+b+c-2c \rightarrow A.P.$

$(a+b+c)-2a,$

$b+c-a,\ a+c-b,\ a+b-c \rightarrow A.P.$

$(b+c+a)(b+c-a),\ (b+c+a)(a+c-b),\ (b+c+a)(a+b-c)$

$\downarrow$ A.P.

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$$100^2-99^2+98^2-97^2+\dots+2^2-1^2$$

$\boxed{Ex-I} \to \underline{\underline{QE}}$

$$(100^2-99^2)+(98^2-97^2)+(96^2-95^2)+\dots+(2^2-1^2)$$

$$[100+99+98+97+96+95+\dots+2+1]$$

$$=\frac{100}{2}(1+100)=5050$$

$\frac{1}{c+a}-\frac{1}{b+c}=\frac{1}{a+b}-\frac{1}{c+a}$

$\frac{b-a}{b+c}=\frac{c-b}{a+b} \Rightarrow b^2-a^2=c^2-b^2$

$\frac{b^2+ab+bc+ca}{(b+a)(b+c)}$

* If $\boxed{a^2, b^2, c^2 \text{ are}}$ in A.P., then P.T. $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in A.P.

$a^2+ab+bc+ca$,

$(a+b)(a+c)$, $(b+a)(b+c)$, $(a+c)(b+c)$