* — Algebra — *

⇒ **formulas :-**

① $(a+b)^2 = a^2+b^2+2ab$

② $(a-b)^2 = a^2+b^2-2ab$

③ $(a+b)^2+(a-b)^2 = 2(a^2+b^2)$

④ $(a+b)^2-(a-b)^2 = 4ab$

⑤ $(a^2-b^2) = (a-b)(a+b)$

⑥ $(a+b)^3 = (a^3+b^3+3ab(a+b))$

⑦ $(a-b)^3 = (a^3-b^3-3ab(a-b))$

⑧ $(a^3+b^3) = (a+b)(a^2+b^2-ab)$

⑨ $(a^3-b^3) = (a-b)(a^2+b^2+ab)$

⑩ $(a+b+c)^2 = a^2+b^2+c^2+2(ab+bc+ca)$

⑪ $(a^2+b^2+c^2-ab-bc-ca) = \frac{1}{2}((a+b)^2+(b-c)^2+(c-a)^2)$

⑫ $(a^3+b^3+c^3-3abc) = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

⑬ $a^3+b^3+c^3-3abc = \frac{1}{2}(a+b+c)\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

given $a^3+b^3+c^3-3abc=0$; $a^3+b^3+c^3=3abc$

1) if $a+b+c=0$

then $a\neq b\neq c$:

2) $a^2+b^2+c^2-ab-bc-ca=0$

$$\boxed{a=b=c}$$

Rule:-

If $x+\frac{1}{x}$ is given, $x^2+\frac{1}{x^2}=?$

Let $x+\frac{1}{x}=k$

$$\left(x+\frac{1}{x}\right)^2=(k)^2$$

$$x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=k^2$$

$$x^2+\frac{1}{x^2}+2=k^2$$

$$x^2+\frac{1}{x^2}=\boxed{k^2-2}$$

$$\boxed{x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2}$$

eg:-

$\Rightarrow$ ① $x + \frac{1}{x} = 4$

$x^2 + \frac{1}{x^2}$

It Should be Same

$x^2 + \frac{1}{x^2} = 4^2$

$x^2 + \frac{1}{x^2} = 16 - 2 = 14$ Ans

②

$3x + \frac{1}{x} = 4$

$9x^2 + \frac{1}{9x^2} = (4)^2$

$9x^2 + \frac{1}{9x^2} = 14$ Ans

③ $(x+1) + \frac{1}{(x+1)} = 4$

$(x+1)^2 + \frac{1}{(x+1)^2} + 2 = 16$

$(x+1)^2 + \frac{1}{(x+1)^2} = 14$ Ans.

$\Rightarrow \quad 3x + \frac{1}{x} = 4$

$9x^2 + \frac{1}{x^2}$

It is not same so. we solve manually

$$9x^2 + \frac{1}{x^2} + 2 \times 3\cancel{x} \times \frac{1}{\cancel{x}} = 16$$

$$9x + \frac{1}{x} = 16 - 6 = 10 \text{ Ans}$$

② Rule :-

If $x - \frac{1}{x}$ is given, then $\left(x^2 - \frac{1}{x^2} = ?\right)$

Let $x - \frac{1}{x} = k$

$$\left(x - \frac{1}{x}\right)^2 = k^2$$

$$x^2 + \frac{1}{x^2} - 2\cancel{x} \times \frac{1}{\cancel{x}} = k^2$$

$$x^2 + \frac{1}{x^2} = \boxed{k^2 + 2}$$

$$\boxed{x^2 + \frac{1}{x^2} \text{ then } \left(x - \frac{1}{x}\right)^2 + 2}$$

③ Rule-3 :-

① If $x^2+\frac{1}{x^2}$ is given ; then $x+\frac{1}{x}=?$

$$x^2+\frac{1}{x^2}=k$$

$$x^2+\frac{1}{x^2}+2\times\frac{x}{x}=k+2$$

$$x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=k+2$$

$$\sqrt{\left(x+\frac{1}{x}\right)^2}=\sqrt{k+2}$$

$$\left(x+\frac{1}{x}\right)=\boxed{\sqrt{k+2}}$$

$$\boxed{x+\frac{1}{x}=\sqrt{x^2+\frac{1}{x^2}+2}}$$

④ Rule - 4 :-

If $x^2+\frac{1}{x^2}$ is given ; $x-\frac{1}{x}=?$

$$x^2+\frac{1}{x^2}=k$$

$$x^2+\frac{1}{x^2}-2\times\frac{x}{x}=k-2$$

$$\sqrt{\left(x-\frac{1}{x}\right)^{2}} = \sqrt{K-2}$$

$$x-\frac{1}{x} = \boxed{\sqrt{K-2}}$$

$$\boxed{x-\frac{1}{x} = \sqrt{x^2+\frac{1}{x^2}-2}}$$

⑤ Rule-5 :-

① If $x+\frac{1}{x}$ is given $\longrightarrow x-\frac{1}{x} = \sqrt{\left(x+\frac{1}{x}\right)^2-4}$

② If $x-\frac{1}{x}$ is given $\longrightarrow x+\frac{1}{x} = \sqrt{\left(x+\frac{1}{x}\right)^2+4}$

⑥ Rule-6 :-

$$\left[x^2-\frac{1}{x^2}\right] = \left(x-\frac{1}{x}\right)\left(x+\frac{1}{x}\right)$$

$$\left[x^4-\frac{1}{x^4}\right] = \left[(x^2)^2-\left(\frac{1}{x^2}\right)^2\right]$$

$$\Rightarrow \left(\left(x^2+\frac{1}{x^2}\right)\left(x^2-\frac{1}{x^2}\right)\right)$$

$$\boxed{\left(x^2+\frac{1}{x^2}\right)\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)}$$

⑦ **Rule - 7 :-**

If $x + \frac{1}{x} = k$

$\rightarrow \boxed{\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{k+2}}$

$\rightarrow \boxed{\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{k-2}}$

⑧ **Rule - 8 :-** $\Rightarrow \boxed{(+)}$

$$\begin{tikzcd}[column sep=large]
x^{\frac{1}{2}} + \frac{1}{x^{\frac{1}{2}}} = z & x + \frac{1}{x} = a \arrow[l, bend left] \arrow[r, bend left, "a^2-2"] & x^2 + \frac{1}{x^2} = b \arrow[l, bend left, "\sqrt{b+2}"] \arrow[r, bend left, "b^2-2"] & x^4 + \frac{1}{x^4} = c \arrow[l, bend left, "\sqrt{c+2}"] \arrow[r, bend left, "c^2-2"] & x^8 + \frac{1}{x^8} = d \arrow[l, bend left, "\sqrt{d+2}"]
\end{tikzcd}$$

⑨ **Rule - 9 :-** $\Rightarrow \boxed{(-)}$

$$\begin{tikzcd}[column sep=large]
x + \frac{1}{x} = a \arrow[r, bend left, "a^2+2"] & x^2 + \frac{1}{x} = b \arrow[l, bend left, "\sqrt{b-2}"] \arrow[r, bend left, "b^2+2"] & x^4 + \frac{1}{x^4} = c \arrow[l, bend left, "\sqrt{c-2}"] \arrow[r, bend left, "c^2+2"] & x^8 + \frac{1}{x^8} = d \arrow[l, bend left, "\sqrt{d-2}"]
\end{tikzcd}$$

10 Rule – 10 :-

(1) If $x+\frac{1}{x}$ is given then $x^3+\frac{1}{x}=?$

Let $x+\frac{1}{x}=k$

$$\left(x+\frac{1}{x}\right)^3=k^3$$

$$x^3+\frac{1}{x^3}+3\times x\times\frac{1}{x}\left(x+\frac{1}{x}\right)=k^3$$

$$x^3+\frac{1}{x^3}+3k=k^3$$

$$x^3+\frac{1}{x^3}=\boxed{k^3-3k}$$

$$\boxed{x^3+\frac{1}{x^3}=\left(x+\frac{1}{x}\right)^3-3\left(x+\frac{1}{x}\right)}$$

(2) If $x-\frac{1}{x}$ is given then $x^3-\frac{1}{x^3}=?$

Let $x-\frac{1}{x}=k$

$$\left(x-\frac{1}{x}\right)^3=k^3$$

$$x^3-\frac{1}{x^3}-3\times x\times\frac{1}{x}\left(x-\frac{1}{x}\right)=k^3$$

$$x^3 - \frac{1}{x^3} - 3k = k^3$$

$$x^3 - \frac{1}{x^3} = \boxed{k^3 + 3k}$$

$$\boxed{x - \frac{1}{x} =} \boxed{x^3 - \frac{1}{x^3} = \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)}$$

⇒ Only Cram all those formulas:-

If $x + \frac{1}{x} = 2$ then $x = 1$

If $x + \frac{1}{x} = -2$ then $x = -1$

If $x + \frac{1}{x} = 1$ then $x^3 = -1$

If $x + \frac{1}{x} = -1$ then $x^3 = +1$

If $x + \frac{1}{x} = \sqrt{3}$ then $x^6 = -1$

If $x = \frac{\sqrt{3}}{2}$ then $\sqrt{1+x} = \frac{\sqrt{3}+1}{2}$

$$\sqrt{1-x} = \frac{\sqrt{3}-1}{2}$$

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

$$x^7 + \frac{1}{x^7} = \left(x^4 + \frac{1}{x^4}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$$

$$\Rightarrow \quad x = \sqrt{3} + \sqrt{2}$$

$$\frac{1}{x} = \frac{1}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} - \sqrt{2}}$$

$$\frac{\sqrt{3} - \sqrt{2}}{(\sqrt{3})^2 - (\sqrt{2})^2} = \frac{\sqrt{3} - \sqrt{2}}{1}$$

$$= \sqrt{3} - \sqrt{2}$$

$$x + \frac{1}{x} = \sqrt{3} + \cancel{\sqrt{2}} + \sqrt{3} - \cancel{\sqrt{2}}$$

$$= 2\sqrt{3} \ \underline{\text{Ans}}$$

SSC Q:-

# $x = 2-\sqrt{3}$	# $x \Rightarrow 5+2\sqrt{6}$
# $\frac{1}{x} = 2+\sqrt{3}$	$\frac{1}{x} = 5-2\sqrt{6}$
# $x = 3+2\sqrt{3}$	# $x = 7+4\sqrt{3}$
# $\frac{1}{x} = 3-2\sqrt{3}$	$\frac{1}{x} = 7-\sqrt{3}$

Q:- $a = 2\sqrt{2}-\sqrt{7}$
$b = 2\sqrt{2}+\sqrt{7}$ $\longrightarrow \frac{1}{1+a} + \frac{1}{1+b}$

Ans

$\frac{1}{a} = 2\sqrt{2}+\sqrt{7}$

$\frac{1}{b} = 2\sqrt{2}+\sqrt{7}$

So = $\boxed{\frac{1}{a} = b}$

then $\frac{1}{1+a} + \frac{1}{1+\frac{1}{a}}$

$= \frac{1}{1+a} + \frac{a}{a+1}$

$= \frac{\cancel{1+a}}{\cancel{1+a}} = 1$ Ans

$\underset{a^2+b^2}{\sqrt{a}} \pm \underset{2ab}{\sqrt{b}}$ ⇒ if this kind of form.

Q:-

$$\sqrt{19 + 8\sqrt{3}} \rightarrow$$

If root under root so that is in $(a+b)$ form so it is solve by method.

$$\frac{a^2+b^2}{19} \qquad \frac{2ab}{8\sqrt{3}}$$

Sol:- $\underbrace{19}_{a^2+b^2} + \underbrace{8\sqrt{3}}_{2ab}$

$$\cancel{2}ab = \overset{4}{\cancel{8}}\sqrt{3}$$

$$ab = \underset{a}{4}\underset{b}{\sqrt{3}}$$

Possible $= a = 4$

$b = \sqrt{3}$

$$\left.\begin{aligned} a^2 &= 16 \\ b^2 &= 3 \end{aligned}\right\} - \underline{19}$$

So $\sqrt{19+8\sqrt{3}}$

$$= \sqrt{(4+\sqrt{3})^2} = \underline{4+\sqrt{3}} \quad \underline{\text{Ans}}$$

Q:- $\sqrt{7 - 4\sqrt{3}}$

$$7 - \underset{\downarrow}{4\sqrt{3}}$$

$$2ab = 4\sqrt{3}$$

$ab = 2\sqrt{3}$

$a = 2$ $\quad a^2 = 4$

$b = \sqrt{3}$ $\quad b^2 = 3$ $\rightarrow 7$

So, $\sqrt{7 - 4\sqrt{3}}$

$\sqrt{(2-\sqrt{3})^2}$

$= 2 - \sqrt{3}$ Ans

$\rightarrow$ $x + \frac{1}{x} = 13$ find $x^2 + \frac{1}{x^2} \Rightarrow (k^2 - 2)$

$(13^2 - 2) = 169 - 2$

$= 167$ Ans

$\rightarrow$ $x - \frac{1}{x} = 13$ find $x^2 + \frac{1}{x^2} \Rightarrow$

$(13^2 + 2) = 169 + 2 = 171$ Ans

$\rightarrow$ $x - \frac{1}{x} = 3$ find $x^4 + \frac{1}{x^4} = ?$

Solⁿ: $x - \frac{1}{x} = 3$ $\quad x^2 + \frac{1}{x^2} = 3^2 + 2 = 11$ $\quad x^4 + \frac{1}{x^4} = (11)^2 - 2 =$

119 Ans

→ $x + \frac{1}{x} = 4$ $\quad x^2 + \frac{1}{x^2} = 4^2 - 2 = \underline{14}$ $\quad x^4 + \frac{1}{x^4} = (14)^2 - 2 = 194$ Ans

→ $x^2 + \frac{1}{x^2} = 39$; find $x + \frac{1}{x}$

; find $x - \frac{1}{x}$

$x + \frac{1}{x} = \sqrt{k+2} = \sqrt{39+2} = \underline{\sqrt{41}}$ Ans

$x - \frac{1}{x} = \sqrt{k-2} = \sqrt{39-2} = \underline{\sqrt{37}}$ Ans

→ $x^4 + \frac{1}{x^4} = 23$ find $x + \frac{1}{x} = ?$

$x - \frac{1}{x} = ?$

$x^4 + \frac{1}{x^4} = 23$ $\quad x^2 + \frac{1}{x^2} = \sqrt{23+2}$ $\quad \underline{x + \frac{1}{x}} = \sqrt{5+2}$

$\sqrt{25}$

5

$\underline{\sqrt{7}}$ Ans

$\underline{x - \frac{1}{x}} = \sqrt{5-2}$

$\underline{\sqrt{3}}$ Ans

→ $x^4 + \frac{1}{x^4} = 47$; find $x + \frac{1}{x} = ?$

find. $x - \frac{1}{x} = ?$

Soln:

$x^2 + \frac{1}{x^2} = \sqrt{47+2} = \sqrt{49} = 7$

$x + \frac{1}{x} = \sqrt{7+2} = \underline{3}$ Ans

$x - \frac{1}{x} = \sqrt{7-2} = \underline{\sqrt{5}}$ Ans

→ $x^4 + \frac{1}{x^4} = 322$; find $x + \frac{1}{x} = ?$ & $x - \frac{1}{x} = ?$

Soln:

$x^2 + \frac{1}{x^2} = \sqrt{322+2} = \underline{18}$

$x + \frac{1}{x} = \sqrt{18+2} = \sqrt{20} = \sqrt{4} \times \sqrt{5} = \underline{2\sqrt{5}}$ Ans

$x - \frac{1}{x} = \sqrt{18-2} = \sqrt{16} = \underline{4}$ Ans

→ $x^{\frac{1}{4}} + \frac{1}{x^{\frac{1}{4}}} = 1$ find $x^{128} + \frac{1}{x^{128}} = ?$

$x^{\frac{1}{2}} + \frac{1}{x^{\frac{1}{2}}} = (1)^2 - 2 = -1$

$x + \frac{1}{x} = (-1)^2 - 2 = -1$

$$x^2+\frac{1}{x^2} = (-1)^2-2 = -1$$

$\vdots$

$$x^{128}\ \frac{1}{x^{128}} = (-1)^2-2 = -1 \text{ Ans}$$

→ $x+\frac{1}{x} = 9$ find $x-\frac{1}{x} = ?$

Sol^n

$$x-\frac{1}{x} = \sqrt{(9)^2-4} = \sqrt{77} \text{ Ans}$$

→ $x-\frac{1}{x} = 8$ find $x+\frac{1}{x} = ?$

Sol^n:-

$$x+\frac{1}{x} = \sqrt{8^2+4} = \sqrt{64+4} = \sqrt{68}$$

$$= \sqrt{17}\times\sqrt{4} = 2\sqrt{17} \text{ Ans}$$

→ $x+\frac{1}{x} = 7$ find $x^2-\frac{1}{x^2} = ?$

$$x^2-\frac{1}{x^2} = \left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$$

$$\left(x-\frac{1}{x}\right) = \sqrt{7^2-4} = \sqrt{49} = 3\sqrt{5}$$

$$\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right) = 7\times 3\sqrt{5} = 21\sqrt{5} \text{ Ans}$$

→ $x - \frac{1}{x} = 3$ find $x^2 - \frac{1}{x^2} = ?$

Sol^n :-

$$\left(x^2 - \frac{1}{x^2}\right) = \left(x - \frac{1}{x}\right)\left(x + \frac{1}{x}\right)$$

$$3 \times \sqrt{13} = \underline{3\sqrt{13}} \text{ Ans}$$

$$\therefore \boxed{x + \frac{1}{x} = \sqrt{3^2 + 4}}$$

→ $x + \frac{1}{x} = 4$ find $x^4 - \frac{1}{x^4} = ?$

Sol^n :-

$$x^4 - \frac{1}{x^4} = \left(x - \frac{1}{x}\right)\left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)$$

$$2\sqrt{3} \times 4 \times 14 = 112\sqrt{3} \text{ Ans}$$

→ $x - \frac{1}{x} = 3$ find $x^4 - \frac{1}{x^4} = ?$

Sol^n :-

$$x^4 - \frac{1}{x^4} = \left(x - \frac{1}{x}\right)\left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)$$

$$3 \times \sqrt{13} \times 11 = \underline{33\sqrt{13}}$$

Ans

$$x^2 + \frac{1}{x^2} = 3^2 + 2 = 11$$

$$x + \frac{1}{x} = 3^2 + 4 = \sqrt{13}$$

→ $x + \frac{1}{x} = 1$ find $x^{49} + \frac{1}{x^{49}} = ?$

Solⁿ.

$\boxed{\therefore x^3 = -1}$

$(x^3)^{16} = (-1)^{16}$

$x^{48} = +1$

$x^{49} + \frac{1}{49}$

$x^{48} \cdot x + \frac{1}{48 \cdot x}$

$1 \cdot x + \frac{1}{1 \cdot x}$

$x + \frac{1}{x} = 1$ Ans

→ $x + \frac{1}{x} = -1$ find $x^{71} + \frac{1}{x^{71}} = ?$

Solⁿ.

$\boxed{x^3 = +1}$

$x^{71} + \frac{1}{x^{71}}$

$\frac{21}{3)\overline{65}}$

$x^{69} = +1$

If 69 completely divide by 3. so we can say the same value.

$x^{69} \cdot x^2 + \frac{1}{x^{69} \cdot x^2}$

$1 \cdot x^2 + \frac{1}{1 \cdot x^2}$

$\therefore x^2 + \frac{1}{x^2} = +1^2 - 2 = -1$ Ans

→ (1) $x + \frac{1}{x} = 1$ find $x^{203} + x^{202} + x^{201} + x^{200} + x^{199} + x^{198}$

Soln.

$= x^{203} + x^{202} + x^{201} + x^{200} + x^{199} + x^{198}$

$x^{201} \cdot x^2 + x^{201} \cdot x + x^{201} + x^{198} \cdot x^2 + x^{198} \cdot x + x^{198}$

$(-1 \cdot x^2) + -(1 \cdot x) + (-1) + (+1 \cdot x^2) + (+1 \cdot x) + (1)$

$= \cancel{-x^2} \cancel{-x} \cancel{-1} \cancel{+x^2} \cancel{+x} \cancel{+1}$

$= 0$ Ans

$\frac{67}{3\,)\,201}$ $\boxed{x^3 = -1}$

$x^{201} = -1$, $x^{198} = +1$

↓

201 complete divide by 3

→ $x^2 + x + 1 = 0$ find $x^3 + 1$

Soln.

$x + 1 + \frac{1}{x} = 0$

$x + \frac{1}{x} = -1$

$\boxed{x^3 = +1}$

$1 + 1 = 2$ Ans

→ $x + \frac{1}{x} = 2$; find $x^5 + \frac{1}{x^5}$ ⇒ Sol^n: $1+1 = 2$ Ans

find $x^{12} + \frac{1}{x^{12}}$ ⇒ Sol: $1+1 = 2$ Ans

find $x^{24} + \frac{1}{x^{23}}$ ⇒ Sol: 2 Ans

→ these is always same on certain time.

find $x^n + \frac{1}{x^n}$ ⇒ 2 Ans

$\boxed{x = 1}$

→ $x + \frac{1}{x} = -2$

$\boxed{x = -1}$

soln: odd.

find $x^5 + \frac{1}{x^5} = -2$ Ans

even.

find $x^{12} + \frac{1}{x^{12}} = 2$ Ans

odd & even.

find $x^{24} + \frac{1}{x^{23}} = 0$

find $x^n + \frac{1}{x^n} = $ n = odd = -2

n = even = 2

→ $x^4 + \frac{1}{x^4} = 47$ find $x^3 + \frac{1}{x^3} = ?$

Solⁿ :-

$x^4 + \frac{1}{x^4} = 47$, $x^2 + \frac{1}{x^2} = \sqrt{47+2} = \sqrt{49} = 7$, $x + \frac{1}{x} = \sqrt{7+2} = \sqrt{9} = \underline{3}$

$$x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$$

$$(3)^3 - 3(3) = 18 \text{ Ans}$$

→ $x^4 + \frac{1}{x^4} = 34$ find $x^3 - \frac{1}{x} = ?$

$x^4 + \frac{1}{x^4} = 34$, $x^2 + \frac{1}{x^2} = \sqrt{34+2} = 6$ $x - \frac{1}{x} = \sqrt{6-2} = \underline{2}$

$$x^3 - \frac{1}{x^3} = \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right)$$

$$(2)^3 + 3(2)$$

$\underline{14}$ $\underline{\text{Ans}}$

→ $x+\frac{1}{x}=5$ find $x^3-\frac{1}{x^3}=?$

Soln.

$x-\frac{1}{x}=\sqrt{5^2-4}=\sqrt{21}$

$\left(x-\frac{1}{x}\right)^3+3\left(x-\frac{1}{x}\right)$

$(\sqrt{21})^3+3(\sqrt{21})$

$21\sqrt{21}+3\sqrt{21}$

$24\sqrt{21}$ Ans

→ $x-\frac{1}{x}=6$ find $x^3+\frac{1}{x^3}=?$

Soln.

$x+\frac{1}{x}=\sqrt{6^2+4}=\sqrt{40}$

$\left(x+\frac{1}{x}\right)^3-3\left(x+\frac{1}{x}\right)$

$(\sqrt{40})^3-3(\sqrt{40})$

$40\sqrt{40}-3\sqrt{40}$

$37\sqrt{40}$ Ans

→ $x+\frac{1}{x}=\sqrt{3}$ find $x^{44}+\frac{1}{x^{44}}$

Soln.

we know

$$\boxed{\therefore x^2+\frac{1}{x^2}=(\sqrt{3})^2-2}$$

$(x^6)^7=(-1)^7$

$\boxed{x^{42}=-1}$

$=x^{42}\cdot x^2+\frac{1}{x^{42}\cdot x^2}$

so $-1\left(x^2+\frac{1}{x^2}\right)$

$-1\times 1=-1$ Ans

Q:- $x+\frac{1}{x}=\sqrt{3}$ find $x^{70}+\frac{1}{x^{70}}=?$

sol^n:-

$\boxed{x^6=-1}$

$(x^6)^{11}=(-1)^{11}=-1$

$x^{66}\cdot x^4+\frac{1}{x^{66}\cdot x^4}$

$-1\left(x^4+\frac{1}{x^4}\right)$

$x+\frac{1}{x}=\sqrt{3}$ $\quad x^2+\frac{1}{x^2}=(\sqrt{3})^2-2=1$ $\quad x^4+\frac{1}{x^4}=(1)^2-2=-1$

$\boxed{x^4+\frac{1}{x^4}=-1}$

$-\left(x^4+\frac{1}{x^4}\right)=-1(-1)=1$ Ans.

Q:- $x+\frac{1}{x}=\sqrt{3}$ find $x^{36}+x^{30}+x^{24}+x^{18}+x^{12}+x^6+x^0$

$+1-1+1-1+1-1+1=1$ Ans

sol^n:

$\boxed{x^6=-1}$

So $= x^{12}=1,\ x^{18}=-1,\ x^{24}=1,\ x^{30}=-1,\ x^{36}=1,\ x^0=1$

Q:- $x+\frac{1}{x}=5$ find $x^5+\frac{1}{x^5}=?$

sol^n:-

$x^2+\frac{1}{x^2}=5^2-2=\boxed{23}$

$x^3+\frac{1}{x^3}=5^3-3(5)=\boxed{110}$

$\left(x^3+\frac{1}{x^3}\right)\left(x^2+\frac{1}{x^2}\right)-\left(x+\frac{1}{x}\right)$

$(110\times 23)-5$

2525 Ans

→ $x + \frac{1}{x} = 5$ find $\frac{3x}{x^4 + 4x + 1}$

Solⁿ :-

$$x^2 + 1 = 5x$$

$$\frac{3x}{5x + 4x} = \frac{3x}{9x} = \frac{1}{3} \text{ Ans}$$

→ $\frac{2p}{p^2 - 4p + 1} = \frac{1}{2}$ find $p + \frac{1}{p} = ?$

Solⁿ :-

$$p^2 - 4p + 1 = 4p$$

$$\frac{p^2 + 1}{p} = \frac{8p}{p}$$

dividing by p $\quad p + \frac{1}{p} = 8$ Ans

→ $\frac{a^2}{b} + \frac{b^2}{a}$ find then given $a = 2 + \sqrt{3}$, $b = 2 - \sqrt{3}$

Solⁿ :-

$$a = 2 + \sqrt{3}$$

$$\frac{1}{a} = 2 - \sqrt{3}$$

$$\boxed{\frac{1}{a} = b}$$

$$\frac{a^2}{b} + \frac{b^2}{a}$$

$$a^3 + \frac{1}{a^3} = (4)^3 - 3(4)$$

52 Ans

→ $x = 5+2\sqrt{6}$

$y = 5-2\sqrt{6}$

find $\dfrac{x^2+y^2}{x^3+y^3} = ?$

Solⁿ:-

$x = 5+2\sqrt{6}$

$\dfrac{1}{x} = 5-2\sqrt{6}$

$y = 5-2\sqrt{6}$

$\boxed{\dfrac{1}{x} = y}$

$$\frac{x^2+\frac{1}{x^2}}{x^3+\frac{1}{x^3}} = \frac{(10)^2-2}{(10)^3-3(10)} = \frac{\cancel{98}}{\cancel{970}} = \frac{49}{485} \text{ Ans}$$

→ $x = 3+2\sqrt{2}$

$xy = 1$

find $\dfrac{x^2+y^2-2xy}{x^3+y^3+3xy}$

Solⁿ:-

$\dfrac{1}{x} = 3-2\sqrt{2}$

$\boxed{y = \dfrac{1}{x}}$

$\boxed{x+\dfrac{1}{x} = 6}$

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

$$\frac{34-2}{198+3} = \frac{32}{201} \text{ Ans}$$

→ $x+\dfrac{1}{x} = 5$

find $x^3+3x+\dfrac{3}{x}+\dfrac{1}{x^3}$

Solⁿ:

$x^3+\dfrac{1}{x^3} = 110$

$110+3(5)$

125 Ans

→ $x + \frac{1}{x} = 5$ find $\frac{x^4 + 3x^3 + 5x^2 + 3x - 1}{x^4 + 1}$

Sol^n:-

$x^2 + \frac{1}{x^2} = 5^2 - 2 = 23$

∴ dividing $\boxed{\frac{N}{D}}$ by x^2

$$= \frac{\frac{x^4}{x^2} + \frac{3x^3}{x^2} + \frac{5x^2}{x^2} + \frac{3x}{x^2} - \frac{1}{x^2}}{\frac{x^4}{x^2} + \frac{1}{x^2}}$$

$$= \frac{x^2 + 3x + 5 + \frac{3}{x} + \frac{1}{x^2}}{x^2 + \frac{1}{x^2}}$$

$$= \frac{23 + 3(5) + 5}{23}$$

$$= \frac{43}{23}$$ Ans

→ $x = 3 + 2\sqrt{2}$ find $\frac{x^6 + x^4 + x^2 + 1}{x^3}$

Sol^n:

$x = 3 + 2\sqrt{2}$

$\frac{1}{x} = 3 - 2\sqrt{2}$

$x + \frac{1}{x} = 6$

∴ dividing $\boxed{\frac{N}{D}}$ by x^3

$x^3 + x + \frac{1}{x} + \frac{1}{x^3}$

$198 + 6 = 204$ Ans

→ $x = 3 + 2\sqrt{3}$ find $\sqrt{x} - \frac{1}{\sqrt{x}} = ?$

Sol^n :-

$\frac{1}{x} = 3 - 2\sqrt{2}$

$x + \frac{1}{x} = 6$

$\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{K - 2}$

$\sqrt{6 - 2}$

$= 2$ Ans

→ $x = 7 + 4\sqrt{3}$ find $\sqrt{x} + \frac{1}{\sqrt{x}} = ?$

Sol^n :-

$\frac{1}{x} = 7 - 4\sqrt{3}$

$x + \frac{1}{x} = 14$

$\sqrt{K + 2}$

$\sqrt{14 + 2} = \sqrt{16} = 4$ Ans

→ $\frac{x}{y} - \frac{y}{x} = 3$ find $\frac{x^3}{y^3} + \frac{y^3}{x^3}$

Sol^n :-

$\frac{x}{y} + \frac{y}{x} = \sqrt{3^2 + 4} = \sqrt{13}$

$\frac{x^3}{y^3} + \frac{y^3}{x^3} = (\sqrt{13})^3 - 3(\sqrt{13})$

$13\sqrt{13} - 3\sqrt{13}$

$10\sqrt{13}$ Ans

→ $x + \frac{1}{16x} = 1$ find $64x^3 + \frac{1}{64x^3}$

Solⁿ:- multiply be 4

$$4x + \frac{1}{4x} = 1 \times 4$$

$$64x^3 + \frac{1}{64x^3} = 4^3 - 3(4) = 52 \text{ Ans}$$

→ $\frac{9x}{2} + 18 = \frac{9}{x}$ find $\frac{x^2}{4} + \frac{1}{x^2} = ?$

Solⁿ:

$$\left(\frac{x}{2} - \frac{1}{x}\right)^2 = \frac{-18}{9} = (-2)^2$$

$$\frac{x^2}{4} + \frac{1}{x^2} - \cancel{2} \times \frac{\cancel{x}}{\cancel{2}} \times \frac{1}{x} = 4$$

$$\frac{x^2}{4} + \frac{1}{x^2} = 5 \text{ Ans}$$

→ $4a - \frac{4}{a} + 3 = 0$ find $a^3 - \frac{1}{a^3} + 3$

Solⁿ:-

$$\left(a - \frac{1}{a}\right) = \frac{3}{4}$$

$$a^3 - \frac{1}{a^3} = \left(\frac{-3}{4}\right)^3 + 3\left(\frac{-3}{4}\right)$$

$$\Rightarrow \frac{171}{64}$$

$$a^3 - \frac{1}{a^3} + 3$$

$$\frac{171}{64} + 3 = \frac{21}{64} \text{ Ans}$$

→ $\frac{x^{24}+1}{x^{12}} = 7$ find $\frac{x^{72}+1}{x^{36}}$

Solⁿ:-

$x^{12} + \frac{1}{x^{12}} = 7$

$x^{36} + \frac{1}{x^{36}}$

$x^{36} + \frac{1}{x^{36}} = 7^3 - 3(7) = 322$ Ans

→ $5a + \frac{1}{3a} = 5$ find $9a^2 + \frac{1}{25a^2}$

Solⁿ:-

$\frac{3}{5}\left(5a + \frac{1}{3a}\right) = 5 \times \frac{3}{5}$

$3a + \frac{1}{5a}$

$\left(3a + \frac{1}{5a}\right)^2 = (3)^2$

$9a^2 + \frac{1}{25a^2} + 2 \times 3a \times \frac{1}{5a} = 9$

$9a^2 + \frac{1}{25a^2} = 9 - \frac{6}{5} = \frac{39}{5}$ Ans

→ $2x - \frac{1}{3x} = 4$ find $27x^3 - \frac{1}{8x^3}$

Solⁿ:-

Sol n:

$$\frac{3}{2}\left(2x-\frac{1}{3x}\right)=4\times\frac{3}{2}$$

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

$$3x-\frac{1}{2x}=6$$

$$27x^3-\frac{1}{8x^3}-3\times3x\times\frac{1}{2x}(6)=6^3=216$$

$$27x^3-\frac{1}{8x^3}=216+27=243 \text{ Ans}$$

→ $x^2+x=5$ find $(x+3)^3+\frac{1}{(x+3)^3}$

Sol n:

Let $a=x+3$

$$\boxed{x=a-3}$$

$$(a-3)^2+(a-3)=5$$

$$a^2+9-6a+a-3=5$$

$$a^2-5a+6-5=0$$

$$a^2-5a+1=0$$

$$a-5-\frac{1}{a}=0$$

$$a+\frac{1}{a}=5$$

$$(x+3)+\frac{1}{(x+3)}=5$$

$5^3-3(5)$

110 Ans

Q :- $x^3 - 3x + 3 = 0$ find $(x-1)^3 + \frac{1}{(x-1)^3}$

Solⁿ:

Let = $\boxed{a = x-1}$

$\boxed{x = a+1}$

$(a+1)^2 - 3(a+1) + 3 = 0$

$a^2 + 1 + 2a - 3a - 3 + 3 = 0$

$a^2 - a + 1 = 0$

$a + \frac{1}{a} = 1$

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

$(1)^3 - 3(1)$

$= -2$ Ans

→ $x^2 - 2x = 7$ find $(x+2)^2 + \frac{1}{(x+2)^2}$

Solⁿ:

Let $a = x+2$

$\boxed{x = a-2}$

$(a-2)^2 - 2(a-2) - 7 = 0$

$a^2 + 4 - 4a - 2a + 4 - 7 = 0$

$a^2 - 6a + 1 = 0$

$a + \frac{1}{a} = 6 = (x+2) + \frac{1}{(x+2)} = 6$

$(6)^2 - 2$

34 Ans

$\rightarrow$ $a = 999$ find $a^2+b^2+c^2-ab-bc-ca=0$

$b = 997$

$c = 995$

Sol^n:- $\frac{1}{2}\left[(a-b)^2+(B-C)^2+(c-a)^2\right]$

$= \frac{1}{2}\left[(2)^2+(2)^2+(-4)^2\right]$

$= \frac{1}{2}\left[4+4+1\right] = 12$

$\rightarrow$ $a = 33$ find $a^3+b^3+c^3-abc=?$

$b = 33$

$c = 34$

Sol^n:- $= \frac{1}{2}(a+b+c)\left[(a-b)^2+(b-c)+(c-a)^2\right]$

$= \frac{1}{2}(100)\left[(0)^2+(1)^2+(1)^2\right]$

$\frac{1}{2}(100)(2) = 100$ Ans

$\rightarrow$ $a^2+b^2+c^2 = ab+bc+cA$ find $\frac{a+b}{c}$

Sol^n:- $a^2+b^2+c^2-a-b-b-c-ca=0$

$\boxed{a=b=c}$

$\frac{a+b}{c} = \frac{1+1}{1} = 2$ Ans

Q:- $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$ find $(a+b+c)^3 = ?$

Solⁿ:-

Let $x + y + z = 0$

$$x^3 + y^3 + z^3 - 3xyz = 0$$

$$x^3 + y^3 + z^3 = 3xyz$$

again put value

$$(a^{\frac{1}{3}}) + (b^{\frac{1}{3}}) + (c^{\frac{1}{3}}) = \left(3 \cdot a^{\frac{1}{3}} \cdot b^{\frac{1}{3}} \cdot c^{\frac{1}{3}}\right)^3$$

27 abc Ans

→ $a + b + c = 6$ find $abc = ?$

$a^2 + b^2 + c^2 = 14$

$a^3 + b^3 + c^3 = 36$

∴ we are squaring nearest no.

Solⁿ:-

$$a + b + c = 6$$

$$a^2 + b^2 + c^2 = 14 \left\{ \begin{array}{l} 9 \\ 4 \\ 1 \end{array} \right.$$

9 + 4 = 13, 13 + 1 = 14

$9 = 3^2$

$4 = 2^2$

$1 = 1^2$

$$a^3 + b^3 + c^3$$

$$3^3 + 2^3 + 1$$

$$27 + 8 + 1 = 36$$

3, 2, 1 satisfy the all equation

$$a \times b \times c$$

$$3 \times 2 \times 1 = 6 \text{ Ans}$$

→ $a+b+c=6$ find $ab+bc+ca=?$

$a^2+b^2+c^2=26$

Solⁿ:

$a+b+c=6$ $a\times b+b\times c+c\times a$

$a^2+b^2+c^2=26$ — 25 — 5 = a; 1 — 1 = b; 0 — 0 = c

$ab+bc+ca$

$(5)(1)+(1)(0)+(0)(5)=5$ Ans

Q:

$a-b=3$ find $a+b=?$

$a^3-b^3=117$

Solⁿ:

$a^3-b^3=117$ — 125 = 5; 8 = 2

$\frac{\ \ }{3}$

$5+2=7$ Ans

→ $A+B+C=0$ find $\frac{a^2}{bc}+\frac{b^2}{ac}+\frac{c^2}{ab}$

Solⁿ:

$a+b+c=0$

$1+1-2=0$

$a=1,\ b=1,\ c=-2.$

$\frac{1}{-2}+\frac{1}{-2}+\frac{4}{1}=3$ Ans

Q:- $P.q.r = 1$ find $\frac{1}{1+P+q} + \frac{1}{1+q+r} + \frac{1}{1+r+P}$

soln:-

$\boxed{P=1}$ $\boxed{q=1}$ $\boxed{r=1}$

$P\ q\ R = 1$

$1 \times 1 \times 1 = 1$

$\frac{1}{1+1+1} + \frac{1}{1+1+1} + \frac{1}{1+1+1}$

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$ Ans

→ $x^2 + x = 2x$ find $x^4 - x^3 + x^2 + 5$

soln:-

$x^4 - x^3 + x^2 + 5$

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

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

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

$2x^2 - 4x - \cancel{2x} + 4 + \cancel{2x} + 3$

$2(2x-2) - 4x + 7$

$4x - 4 - 4x + 7 = 3$ Ans

→ $a+b+c = 2s$ find $(s-a)^3 + (s-b)^3 + 3(s-a) \times (s-b)c$

soln:-

option.

A) c

B) c^2

C) c^3 ✓

d) c^4

$a+b+c = 2s$

$c = s + s - a - b$

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

Ans $c^3 = (s-a)^3 + (s-b)^3 + 3(s-a)(s-b)c$

or

Value based

$$a+b+c=2s$$

$$2+2+2=2(3)$$

$$a-b=c=2$$

$$s=3$$

$$(s-a)^3+(s-b)^3+3(s-a)(s-b)c$$

$$(3-2)^3+(3-2)^3+3(3-2)(3-2)2$$

$$1+1+6=8$$

$$(2)^3$$

c^3 Ans

→ $\frac{x-a^2}{b^2+c^2}+\frac{x-b^2}{a^2+c^2}+\frac{x-c^2}{a^2+b^2}=3$ find x?

Soln:

$$\frac{x-a^2}{b^2+c^2}+\frac{x-b^2}{a^2+c^2}+\frac{x-c^2}{a^2+b^2}=3 \qquad 1+1+1$$

$$\frac{x-a^2}{b^2+c}=1 \qquad \boxed{x=a^2+b^2+c^2}$$

Ans

→ $a^2+b^2+c^2=2(a-b-c)=3$ find $2a-3b+4c$

Soln:

$$a^2+b^2+c^2=2a-2b+2c+1+1+1=0$$

$$(a-1)^2+(b+1)^2+(c+1)^2=0$$

$a=1$

$b=-1$

$c=-1$

$$2a-3b+4c$$

$$2(1)-3(-1)+4(-1)$$

$$2+3-4=5-4=1 \text{ Ans}$$

→ $a^x = (x+y+z)^y$ find $x+y+z = ?$

$a^y = (x+y+z)^z$

$a^z = (x+y+z)^x$

Sol^n:

$$a^{x+y+z} = (x+y+z)^{x+y+z}$$

$$x+y+z = a$$ Ans

→ $\frac{a}{b} + \frac{b}{a} = 1$ find $3(a^3 - b^3)$

Sol^n:

$$\frac{a^2+b^2}{ab} = 1$$

$3[(a-b)\cdot(a^2+b^2+ab)]$

$3[(a-b)\ 0] = 0$ Ans

$$a^2+b^2 = -ab$$

$$a^2+b^2+ab = 0$$

→ $ab(a+b) = 1$ find $\frac{1}{a^3b^3} - a^3 - b^3 = ?$

Sol^n:

$$a+b = \frac{1}{ab}$$

$$a^3 + b^3 + 3ab(a+b) = \frac{1}{a^3b^3}$$

$$3\cancel{ab} \times \frac{1}{\cancel{ab}} = \frac{1}{a^3+b^3} - a^3 - b^3$$

③ $= \dfrac{1}{a^3+b^3} - a^3 - b^3$

Ans

→ $\dfrac{1}{\sqrt{7}-\sqrt{6}} - \dfrac{1}{\sqrt{6}-\sqrt{5}} + \dfrac{1}{\sqrt{5}-2} - \dfrac{1}{\sqrt{8}-\sqrt{7}} + \dfrac{1}{3-\sqrt{8}}$

Solⁿ:- Rationalization.

$$\cancel{\sqrt{7}} + \cancel{\sqrt{6}} - \cancel{\sqrt{6}} - \cancel{\sqrt{5}} + \cancel{\sqrt{5}} + 2 - \cancel{\sqrt{8}} - \sqrt{7} + 3 + \cancel{\sqrt{8}}$$

$= 5$ Ans

→ $x^3 + 3x^2 - kx + 4$ is complete divisible by $x-2$, then find k.

Solⁿ:-

$x - 2 = 0$

$x = 2$

$$x^3 + 3x^2 - kx + 4$$

$$(2)^3 + 3(2)^2 - k\cdot 2 + 4 = 0$$

$$\cancel{-}2k = \cancel{-}24$$

$$\boxed{k = 12}$$ Ans

→ If $x = 11$ then find $x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 11$

Solⁿ:-

$$x^5 - 12x^4 + 12x^3 - 12x^2 + 12x - 11 \quad \boxed{x = 11}$$

$$x^5 - 11x^4 - x^4 + 11x^3 + x^3 - 11x^2 + x^2 + 11x + x - 11$$

$$\cancel{x^5} - \cancel{x\cdot x^4} - \cancel{x^4} + \cancel{x\cdot x^3} + \cancel{x^3} - \cancel{x\cdot x^2} + \cancel{x^2} + \cancel{x\cdot x} + \cancel{x} - \cancel{11}$$

$= 0$ Ans

Q1: $P = 99$ find $P(P^2+3P+3)$

Soln:

$$P(P^2+3P+3)$$

$$(P^3+3P^2+3P+1-1)$$

$$(P+1)^3-1$$

$$(99-1)^3-1$$

$$(100)^3-1$$

$$1000000-1$$

$$\underline{999999} \text{ Ans}$$

Q:

$$\frac{1}{1+2^{a-b}}+\frac{1}{1+2^{b-a}}$$

Soln:

$$\frac{1}{1+\frac{2^a}{2^b}}+\frac{1}{1+\frac{2^b}{2^a}}$$

$$\frac{2^b}{2^b+2^a}+\frac{2^a}{2^b+2^a}=\frac{\cancel{2^b+2^a}}{\cancel{2^b+2^a}}=1 \text{ Ans}$$

$$\boxed{\begin{array}{c} C \,\&\, D \\ \frac{x}{y} = \frac{5}{2} \\ \text{Apply} \cdot C \,\&\, D \\ \frac{x+y}{x-y} = \frac{5+2}{5-2} \end{array}} \rightarrow \underline{\text{method}}$$

Q:- $x = \dfrac{2\sqrt{6}}{\sqrt{3}+\sqrt{2}}$ find $\dfrac{x+\sqrt{3}}{x-\sqrt{3}} + \dfrac{x+\sqrt{2}}{x-\sqrt{2}}$

Sol^n:-

$$x = \frac{2\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$x = \frac{2\times\sqrt{3}\times\sqrt{2}}{\sqrt{3}\times\sqrt{2}}$$

$$\frac{x}{\sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

$$\frac{x+\sqrt{3}}{x-\sqrt{3}} = \frac{2\sqrt{2}+\sqrt{3}+\sqrt{2}}{2\sqrt{2}-\sqrt{3}-\sqrt{2}} \quad -(1)$$

$$\frac{x}{\sqrt{2}} = \frac{2\sqrt{3}}{\sqrt{3}+\sqrt{2}}$$

$$\frac{x+\sqrt{2}}{x-\sqrt{2}} \Rightarrow \frac{2\sqrt{3}+\sqrt{3}+\sqrt{2}}{2\sqrt{3}-\sqrt{3}-\sqrt{2}} \quad -(2)$$

(1) & (2) add

$= 2$ Ans

SSC

→ $\dfrac{2\sqrt{24}}{\sqrt{3}+\sqrt{2}}$. find $\dfrac{x+\sqrt{12}}{x-\sqrt{12}} + \dfrac{x+\sqrt{8}}{x-\sqrt{8}}$

solⁿ:

→ $x = \dfrac{4ab}{a+b}$ find $\dfrac{x-2a}{x-2a} + \dfrac{x+2b}{x-2b}$

→ $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$ find $x^3 - 6x^2 + 18x$

solⁿ: $x - 2 = 2^{\frac{2}{3}} - 2^{\frac{1}{3}}$

$(x-2)^3 = \left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)^3$

$x^3 - 8 - 3x \times 2(x-2) = 2^2 - 2 - 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}} \cdot (x-2)$

$x^3 - 8 - 6x^2 + 12x = 4 - 2 - 6x + 12$

$= 22$ Ans

OR Short Trick $x^3 - 6x^2 + 18x$

$x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$ $x=2$

$2^3 + 3\times 2^2 - 2^1 + 2^2$

Base value always use 3

$\Rightarrow 22$ Ans

Q: $x = 5 + 5^{\frac{1}{3}} + 5^{\frac{2}{3}}$ find $x^3 - 15x^2 + 6x + 100$

Soln: $5 + 5^{\frac{1}{3}} + 5^{\frac{2}{3}}$

$5^3 - 3(5)^2 + 5^1 + 5^2 + 100$

Trick

80 + 100

= 180 Ans

$5 + 5^{\frac{1}{3}} + 5^{\frac{2}{3}}$.

$x^3 - 15x^2 + 6x + 100 = 5^3 - 3(5)^2 + 5^1 + 5^2 + 100$.

$80 + 100$

$= 180$ Ans