

19. $x^2 - 3x + 1 = 0$, then find the value of $x^9 + x^7 + x^{-9} + x^{-7}$?

$x^2 - 3x + 1 = 0$ तब $x^9 + x^7 + x^{-9} + x^{-7}$? का मान बताओ

~~[A]~~ 6621

[B] 4414

[C] 9208

[D] 6069

$$x^2 + 1 = 3x$$

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

$$= 3^2 - 2 = 7$$

$$= 7^2 - 2 = 47$$

$$= 47^2 - 2 = 2207$$

$$x^9 + x^7 + \frac{1}{x^9} + \frac{1}{x^7}$$

$$= x^7(x^2 + 1) + \frac{(1 + x^2)}{x^9}$$

$$= 3x^8 + \frac{3}{x^8} = 3\left(x^8 + \frac{1}{x^8}\right) = 3 \times 2207$$

20. If $x^2 - 4x + 1 = 0$, then what is the value of $x^9 + x^7 - 194x^5 - 194x^3$?

यदि $x^2 - 4x + 1 = 0$ है, तो $x^9 + x^7 - 194x^5 - 194x^3$ का मान क्या होगा?

[A] 4

[B] -4

[C] 1

[D] -1

(SSC CGL 20/7 MAINS)

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

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

$$x^4 + \frac{1}{x^4} = 194$$

$$= x^9 + x^7 - \left(x^4 + \frac{1}{x^4}\right) \cdot x^5 - \left(x^4 + \frac{1}{x^4}\right) \cdot x^3$$

$$= \cancel{x^9} + \cancel{x^7} - \cancel{x^9} - x - \cancel{x^7} - \frac{1}{x}$$

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

$$= -4$$

21. If $x^2 - 3x + 1 = 0$, then what is the value of $x^{12} + x^8 - 123x^7 - 123x^3$?

यदि $x^2 - 3x + 1 = 0$ है, तो $x^{12} + x^8 - 123x^7 - 123x^3$ का मान क्या होगा?

[A] 7

[B] -3

[C] -7

[D] 3

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

$$x^5 + \frac{1}{x^5} = 7 \times 18 - 3$$

$$x^5 + \frac{1}{x^5} = 123$$

$$= x^{12} + x^8 - \left(x^5 + \frac{1}{x^5}\right) \cdot x^7 - \left(x^5 + \frac{1}{x^5}\right) \cdot x^3$$

$$= \cancel{x^{12}} + \cancel{x^8} - \cancel{x^{12}} - \cancel{x^8} - \cancel{x^8} - \frac{1}{\cancel{x^2}}$$

$$= -\left(x^2 + \frac{1}{x^2}\right) = -7$$

22. If $x^4 = 322 - \frac{1}{x^4}$ and $x \geq 1$, then find the value of $x^3 - \frac{1}{x^3}$.
यदि $x^4 = 322 - \frac{1}{x^4}$ और $x \geq 1$ है, तो $x^3 - \frac{1}{x^3}$ का मान ज्ञात कीजिए।

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- ☒ [A] 76 [B] 72
[C] 64 [D] 62

$$\begin{aligned} & \rightarrow 4^3 + 3 \times 4 \\ & = 76 \end{aligned}$$

$$x^4 + \frac{1}{x^4} = 322$$

$$x^2 + \frac{1}{x^2} = \sqrt{324} = 18$$

$$x - \frac{1}{x} = \sqrt{16} = 4$$

23. If $x - \frac{1}{x} = 1$, then $\left\{ \frac{1}{x-1} - \frac{1}{x+1} + \frac{1}{x^2+1} - \frac{1}{x^2-1} \right\} = ?$

यदि $x - \frac{1}{x} = 1$ है, तो $\left\{ \frac{1}{x-1} - \frac{1}{x+1} + \frac{1}{x^2+1} - \frac{1}{x^2-1} \right\} = ?$

[A] $\pm\sqrt{5}$

[B] $\frac{2}{5}$

[C] $\pm\frac{2}{\sqrt{5}}$

[D] $\pm\frac{\sqrt{5}}{2}$

(SSC
G/L
20/7
Proc)

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

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

$$= \frac{2}{1 \pm \sqrt{5}} = \pm \frac{2}{\sqrt{5}}$$

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

$$= \frac{x^2/x^2}{x^4-1/x^2}$$

24. If $x\sqrt{x} + \frac{1}{x\sqrt{x}} = 110$, then find $x^2\sqrt{x} + \frac{1}{x^2\sqrt{x}}$?

यदि $x\sqrt{x} + \frac{1}{x\sqrt{x}} = 110$ है, तो $x^2\sqrt{x} + \frac{1}{x^2\sqrt{x}}$ ज्ञात कीजिये?

[A] 2525

[B] 12098

[C] 140

[D] 3645

$$\sqrt{x}^3 + \frac{1}{\sqrt{x}^3} = 110$$

$$\sqrt{x}^5 + \frac{1}{\sqrt{x}^5} = 2525$$

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

$$\sqrt{x} + \frac{1}{\sqrt{x}} = 5$$

IF, $x + \frac{1}{x} = \sqrt{3} \Rightarrow x^6 + 1 = 0$ या $x^6 = -1$

CONCEPT



तो $x^3 + \frac{1}{x^3} = (\sqrt{3})^3 - 3\sqrt{3} = 0$

OR

$$\frac{x^6 + 1}{x^3} = 0$$

$$\Rightarrow x^6 + 1 = 0$$

$$\Rightarrow x^6 = -1$$

if, $x + \frac{1}{x} = \sqrt{3} \Rightarrow x^6 + 1 = 0 \Rightarrow x^6 = -1$

$(-1)^{\text{odd}} = -1$
 $(-1)^{\text{even}} = 1$

तो $\cancel{x^{23} + x^{23}} + \cancel{x^{15} + x^9} + x^6 + 4 = ?$

$= \cancel{x^{23} \cdot (x^6 + 1)} + \cancel{x^9 \cdot (x^6 + 1)} + x^6 + 4 = 3$

$$x^{61} + \frac{1}{x^{61}} = x + \frac{1}{x} = \sqrt{3}$$

$$\begin{aligned} x^{61} &= (x^6)^{10} \times x \\ &= (-1)^{10} \times x \\ &= x \end{aligned}$$



$$x + \frac{1}{x} = \text{special case}$$



18. If $\left(x + \frac{1}{x} + 1\right)\left(x + \frac{1}{x} - 1\right) = 2$, then

($x > 0$) यदि $\left(x + \frac{1}{x} + 1\right)\left(x + \frac{1}{x} - 1\right) = 2$ है, तो

[A] $x^{38} + \frac{1}{x^{38}} = ?$

[B] $x^{53} + \frac{1}{x^{53}} = ?$

[C] $x^{75} + \frac{1}{x^{75}} = ?$

[D] ~~$x^{320} + x^{314} + x^{250} + x^{244} + x^{94} + x^{88} + x^{45} + x^{39} + x^6 + 5 = 4$~~

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

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

$$\Rightarrow x^6 + 1 = 0$$

या $x^6 = -1$

$$x^{38} + \frac{1}{x^{38}} = x^2 + \frac{1}{x^2} = \sqrt{3}^2 - 2 = 1$$

$$x^{75} + \frac{1}{x^{75}} = x^3 + \frac{1}{x^3} = 0$$

$$x^{38} = (x^6)^6 \times x^2$$
$$= x^2$$

$$x^{75} = (x^6)^{12} \times x^3$$
$$= x^3$$

18. If $\left(x + \frac{1}{x} + 1\right)\left(x + \frac{1}{x} - 1\right) = 2$, then

($x > 0$) यदि $\left(x + \frac{1}{x} + 1\right)\left(x + \frac{1}{x} - 1\right) = 2$ है, तो

[A] $x^{38} + \frac{1}{x^{38}} = ?$

[B] $x^{53} + \frac{1}{x^{53}} = ?$

[C] $x^{75} + \frac{1}{x^{75}} = ?$

[D] ~~$x^{320} + x^{314} + x^{250} + x^{244} + x^{94} + x^{88} + x^{45} + x^{39} + x^6 + 5 = 4$~~

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

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

$$\Rightarrow x^6 + 1 = 0$$

या $x^6 = -1$

$$\begin{aligned} x^{53} + \frac{1}{x^{53}} &= -\frac{1}{x} - x \\ &= -\left(x + \frac{1}{x}\right) \\ &= -\sqrt{3} \end{aligned}$$

$$x^{53} = \frac{x^{54}}{x} = \frac{(x^6)^9}{x} = -\frac{1}{x}$$

CONCEPT



If, $x + \frac{1}{x} = 2$ तो, $x = 1$

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



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

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

$$x^2 - 2x + 1 = 0$$

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

$$x-1=0$$

$$\Rightarrow x=1$$

25. If $x + \frac{1}{x} = 2$, then the value of $x^{11} + \frac{1}{x^{20}}$?

यदि $x + \frac{1}{x} = 2$, तो $x^{11} + \frac{1}{x^{20}}$ का मान क्या है?

[A] 7

1+1

☒ [B] 2

[C] 1

[D] 0

$x=1$

26. If $m + \frac{1}{m-3} = 5$, then $(m-3)^8 + \frac{1}{(m-3)^8} = ?$

यदि $m + \frac{1}{m-3} = 5$ है, तो $(m-3)^8 + \frac{1}{(m-3)^8} = ?$

[A] 2

[B] 0

[C] -2

[D] 15

$$(m-3) + \frac{1}{m-3} = 2$$

$$\Rightarrow m-3=1$$

$$m=4$$

27. If $K + \frac{1}{K} + 2 = 0$ and $K < 0$, then what is the value of $K^{17} + \frac{1}{K^{11}}$?

यदि $K + \frac{1}{K} + 2 = 0$ और $K < 0$, तो $K^{17} + \frac{1}{K^{11}}$ का मान क्या है?

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[A] -17

[C] -1

[B] -2 ✓

[D] 0

$$K + \frac{1}{K} = -2$$

$$\Rightarrow K = -1$$

28. If $x + \frac{1}{x} = -2$, then what is the value of $x^7 + x^{-7} + x^2 + x^{-2}$? ($x < 0$)

यदि $x + \frac{1}{x} = -2$, तो $x^7 + x^{-7} + x^2 + x^{-2}$ का मान क्या है? ($x < 0$)

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[A] 4

[B] 2

[C] 1

[D] 0

$x = -1$

29. If $x + \frac{1}{x+5} = -7$ then $(x+5)^{19} - \frac{1}{(x+7)^{28}} = ?$

यदि $x + \frac{1}{x+5} = -7$ है तो $(x+5)^{19} - \frac{1}{(x+7)^{28}} = ?$

[A] 0

[B] 2

[C] -2

[D] 1

$$(x+5) + \frac{1}{x+5} = -2$$

$$-1 - 1 = -2$$

$$\Rightarrow x+5 = -1$$

$$x = -6$$

30. If $3x + \frac{1}{3x} + 2 = 0$, then $243x^7 + \frac{1}{81x^2} = ?$

यदि $3x + \frac{1}{3x} + 2 = 0$ है, तो $243x^7 + \frac{1}{81x^2} = ?$

[A] 2

[B] 4

[C] 0

[D] 1

~~$\frac{1}{81x^2}$~~

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

$= -\frac{1}{9} + \frac{1}{9} = 0$

$\Rightarrow 3x = -1$

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

31. If $x + \frac{1}{x} = -2$, then $x^{2n+1} + \frac{1}{x^{2n+4}} = ?$ (where n is an integer)

यदि $x + \frac{1}{x} = -2$ है, तो $x^{\overset{\text{odd}}{2n+1}} + \frac{1}{x^{\overset{\text{even}}{2n+4}}} = ?$ (जहाँ n एक पूर्णांक है)

[A] 2

[B] 4

[C] -2

[D] 0

$$x = -1$$

$$-1 + 1 = 0$$

32. If $\frac{x}{5} + \frac{5}{x} = -2$, then what is the value of x^3 ?

यदि $\left(\frac{x}{5}\right) + \left(\frac{5}{x}\right) = -2$ है, तो x^3 का मान क्या है?

[A] -125

[B] -25

[C] $\frac{1}{125}$

[D] 625

$$\frac{x}{5} = -1$$

$$x = -5$$

$$(-5)^3$$

if, $x + \frac{1}{x} = 1$
या
 $x^2 - x + 1 = 0$

तो $x^3 = -1$

① $x + \frac{1}{x} = 1$

तो $x^3 + \frac{1}{x^3} = -2$

$\Rightarrow x^3 = -1$

② $x + \frac{1}{x} = 1$

$(x+1) \times (x^2 - x + 1) = 0 \times (x+1)$

$x^3 + 1 = 0$

$x^3 = -1$

CONCEPT



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

OR

$$x^2 - x + 1 = 0$$

$$\rightarrow x^3 = -1$$



33. If $x + \frac{1}{x} = 1$, then the value of $x^{12} + x^9 + x^6 + x^3 + 1$ is:

यदि $x + \frac{1}{x} = 1$ है, तो ~~$x^{12} + x^9 + x^6 + x^3 + 1$~~ का मान क्या है?

(SSC CGL 2022)

[A] 1 ✓

[B] -1

[C] 0

[D] -2

$$\Rightarrow x^3 = -1$$

$$x^3 + 1 = 0$$

34. If $\frac{x}{y} + \frac{y}{x} = 1$ & $x + y = 2$, then the value of $x^3 + y^3$?

यदि $\frac{x}{y} + \frac{y}{x} = 1$ & ~~$x + y = 2$~~ , तो $x^3 + y^3$ का मान क्या होगा?

(CPO 2023)

[A] 0

[B] 1

[C] 3

[D] 2

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

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

35. If $\frac{x}{y} + \frac{y}{x} = 1$, and $x, y \neq 0$, then find the value of $x^6 + y^6 + 2x^3y^3$.

यदि $\frac{x}{y} + \frac{y}{x} = 1$, और $x, y \neq 0$ है, तो $x^6 + y^6 + 2x^3y^3$ का मान ज्ञात करें।

(SSC CPO 2023)

[A] 0 ✓

[C] x^3y^3

[B] 1

[D] $3x^3y^3$

$$\begin{aligned} & \swarrow (x^3 + y^3)^2 \\ & = 0 \end{aligned}$$

36. If, $\frac{r}{13} + \frac{13}{r} = 1$ then the value of r^3 is:

यदि $\left(\frac{r}{13}\right) + \left(\frac{13}{r}\right) = 1$ है, तो r^3 का मान ज्ञात कीजिए।

(SSC CGL 2022)

[A] -2157

[C] 2157

[B] 2197

☒ [D] -2197

$$\left(\frac{r}{13}\right)^3 = -1$$

$$r^3 = -2197$$

37. If $x + \frac{1}{x} = 1$, then $(1 + x + x^2)(1 - x - x^2) = ?$

यदि $x + \frac{1}{x} = 1$ है, तो $(1 + x + x^2)(1 - x - x^2) = ?$

[A] 0

[B] 4

[C] -2

[D] 1

$$\begin{aligned}x^2 + 1 &= x \\1 - x &= -x^2 \\ \Rightarrow x^3 &= -1\end{aligned}$$

$$\begin{aligned}&= x^2x - x^2 \\&= -4x^3 \\&= -4x - 1 = 4\end{aligned}$$

38. If $4x^2 + \frac{1}{x^2} = 2$, then find $8x^3 + \frac{1}{x^3} = ?$

यदि $4x^2 + \frac{1}{x^2} = 2$ है, तो $8x^3 + \frac{1}{x^3}$ ज्ञात कीजिए।

[A] 0

[B] 1

[C] 2

[D] 4

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

$$\Rightarrow (x^2)^3 = -1$$

$$x^6 = -1$$

$$= \frac{8x^6 + 1}{x^3} = 0$$

39. If $x^5 + \frac{1}{x^5} = 1$, then $x^{180} + x^{165} + x^{145} + x^{130} - 2x^{105} + x^{80} + x^{70} - x^{15} + 3 = ?$

यदि $x^5 + \frac{1}{x^5} = 1$ है, तो $x^{180} + x^{165} + x^{145} + x^{130} - 2x^{105} + x^{80} + x^{70} - x^{15} + 3 = ?$

[A] 3

[B] 6

[C] 4

[D] 5

$$(x^5)^3 = -1$$

$$\Rightarrow x^{15} = -1$$

$$\Rightarrow x^{15} + 1 = 0$$

$$(x^{15})^7 = (-1)^7 = -1$$

$$x^{80} = (x^{15})^5 \times x^5 = -x^5$$

$$x^{70} = \frac{x^{75}}{x^5} = -\frac{1}{x^5}$$

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

40. If $x^2 - 7x + 13 = 0$, then $(x - 3)^{22} + \frac{1}{(x-3)^{22}} = ?$

यदि $x^2 - 7x + 13 = 0$ है, तो $(x - 3)^{22} + \frac{1}{(x-3)^{22}} = ?$

[A] 3 माना $x-3=y$

[C] $-1 \Rightarrow x = y+3$

[B] 1

[D] -2

$$y^2 + 6y + 9 - 7y - 21 + 13 = 0$$

$$y^2 - y + 1 = 0 \Rightarrow y^3 = -1$$

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

$$y^{22} + \frac{1}{y^{22}} = -\left(y + \frac{1}{y}\right) = -1$$

$$y^{22} = y^{21} \times y = -y$$