



UP – TGT

प्रशिक्षित स्नातक शिक्षक

उत्तर प्रदेश माध्यमिक शिक्षा सेवा चयन बोर्ड

गणित

भाग – 2

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बीजगणितीय तादात्म्य (ALGEBRAIC IDENTITIES)

□ महत्वपूर्ण नियम →

$$(1) (a+b)^2 = a^2 + b^2 + 2ab$$

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

$$(3) (a+b)^2 = (a+b)^2 + 4ab$$

$$(4) (a-b)^2 = (a+b)^2 - 4ab$$

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

$$(6) (a+b)^3 = a^3 + b^3 + 3ab(a+b)$$

$$(7) (a-b)^3 = a^3 - b^3 - 3ab(a-b)$$

$$(8) (a^3 + b^3) = (a+b)(a^2 - ab + b^2)$$

$$(9) (a^3 - b^3) = (a-b)(a^2 + ab + b^2)$$

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

$$\begin{aligned}
 (11) \quad a^3 + b^3 + c^3 - 3abc &= (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca) \\
 &= \frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]
 \end{aligned}$$

तो $a^3 + b^3 + c^3 - 3abc = 0$

$$\text{If } \left\{ \begin{array}{l} \text{(i) } a+b+c = 0 \quad (a \neq b \neq c) \\ \text{(ii) } a^2 + b^2 + c^2 - ab - bc - ca = 0 \quad \text{i.e. } a=b=c \end{array} \right\}$$

$$(12) \quad a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2} [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$(13) \quad \text{If } ax^2 + bx + c = 0$$

$$\text{then, } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

सुद महत्वपूर्ण नियम →

$$(14) \quad \text{यदि } x + \frac{1}{x} = a \quad \text{तो}$$

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

$$(ii) \quad x^4 + \frac{1}{x^4} = b^2 - 2 \quad \text{तो } a^2 - 2$$

$$(15) \quad \text{यदि } x - \frac{1}{x} = a \quad \text{तो}$$

$$(i) \quad x^2 + \frac{1}{x^2} = a^2 + 2$$

$$(ii) \quad x^4 + \frac{1}{x^4} = b^2 - 2, \quad \text{जहाँ } b = a^2 + 2$$

$$(16) \quad (16) \quad x^4 - \frac{1}{x^4} = a, \quad \text{तब}$$

$$(P) \quad x^2 + \frac{1}{x^2} = \sqrt{a+2} = b \quad (ii) \quad x + \frac{1}{x} = \sqrt{b+2} \quad (iii) \quad x - \frac{1}{x} = \sqrt{b-2}$$

17) यदि $x + \frac{1}{x} = 2$ तो $x = 1$

18) यदि $x + \frac{1}{x} = -2$ तो $x = -1$

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

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

21) यदि $x + \frac{1}{x} = -1$ तो $x^3 = 1$

22) यदि $x + \frac{1}{x} = +1$ तो $x^3 = -1$

23) यदि $x + \frac{1}{x} = \sqrt{3}$ तो $x^3 + \frac{1}{x^3} = 0$, $x^6 = -1$ या $\boxed{(x^6 + 1) = 0}$

24) यदि $ax + by = m$
 $bx - ay = n$ तो

$$(a^2 + b^2)(x^2 + y^2) = m^2 + n^2$$

Note- यदि वास्तविक संख्याओं के वर्गों का योग 0 है तो वे सभी संख्याएँ 0 की होंगी। i.e.

यदि $(x-a)^2 + (y-b)^2 + (z-c)^2 = 0$, तो

$$x-a = 0 \Rightarrow x = a$$

$$y-b = 0 \Rightarrow y = b$$

$$z-c = 0 \Rightarrow z = c$$

या $x^2 + y^2 + z^2 = 0$, तो $x=0, y=0$ & $z=0$

Exercise

① यदि $a = -5$, $b = 6$, $c = 10$, तो -

$$\frac{a^3 + b^3 + c^3 - 3abc}{(a+b+c) - (a^2 + b^2 + c^2)}$$
 का मान होगा ?

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

$$\boxed{\text{ans} = 1}$$

② यदि $x - \frac{1}{x} = 6$ तो $x^2 + \frac{1}{x^2}$ का मान होगा ? $\boxed{\text{ans} = 38}$

③ यदि $x^2 + \frac{1}{x^2} = 5$ तो $x - \frac{1}{x}$ का मान होगा ? $\boxed{\text{ans} = \pm 7}$

④ $x - \frac{3}{x}$ का मान ज्ञात कीजिये यदि $x + \frac{3}{x} = 4$ $\boxed{\text{ans} = \pm 2}$

⑤ $x - \frac{1}{x} = 6$, तो $x^3 - \frac{1}{x^3}$ का मान होगा ? $\boxed{\text{ans} = 234}$

⑥ $x + \frac{1}{x} = 2$, तो $x^3 + \frac{1}{x^3}$ का मान होगा ? $\boxed{\text{ans} = 2}$

⑦ $x + \frac{1}{x} = 2$ तो $x^{17} + \frac{1}{x^{17}}$ का मान होगा ? $\boxed{\text{ans} = 2}$

⑧ यदि $x + y + z = 15$, $xy + yz + zx = 55$, तो $x^2 + y^2 + z^2$ का मान होगा ? $\boxed{\text{ans} = 55}$

⑨ $x^2 + y^2 + z^2 = 576$ और $xy + yz + zx = 50$, तो $x + y + z$ का मान ज्ञात करें ? $\boxed{\text{ans} = \pm 26}$

⑩ यदि $5x - \frac{5}{x} = 10$ तो $x^2 + \frac{1}{x^2}$ का मान ज्ञात करें ?

$$\boxed{\text{ans} = 6}$$

11) यदि $x = \frac{a^2-25}{a^2-36}$ और $y = \frac{a+5}{a+6}$, तो $\frac{x}{y}$ का मान ज्ञात करें ?

$$\boxed{\text{Ans} = \frac{a-5}{a-6}}$$

12) यदि $x = a^{2/3} - a^{-2/3}$ तो $x^3 + 3x$ का मान ज्ञात करें ?

$$\boxed{\text{Ans} = a^2 - \frac{1}{a^2}}$$

13) $\frac{x^2 - y^2 - 2yz - z^2}{x^2 + y^2 + 2xy - z^2} = ?$

$$\boxed{\text{Ans} = \frac{x-y-z}{x+y-z}}$$

14) यदि $x = 27$ और $\sqrt[3]{x} + \sqrt[3]{y} = \sqrt[3]{729}$, तो y का मान ज्ञात करें ?

$$\boxed{\text{Ans} = 216}$$

15) यदि $(a-b) = 3$, $(b-c) = 5$ और $(c-a) = 1$ तो $\frac{a^3 + b^3 + c^3 - 3abc}{a+b+c}$ का मान ज्ञात करें ?

$$\boxed{\text{Ans} = 17.5}$$

16) यदि $a+b = 5$, $a^2 + b^2 = 13$ तो $a-b$ का मान होगा (जहाँ $a > b$)

$$\boxed{\text{Ans} = 1}$$

17) यदि $a + \frac{1}{a+2} = 0$, तो $(a+2)^3 + \frac{1}{(a+2)^3}$ का मान होगा ?

$$\boxed{\text{Ans} = 2}$$

18) यदि $a=25$, $b=15$, $c=-10$ तो

$\frac{a^3 + b^3 + c^3 - 3abc}{(a-b)^2 + (b-c)^2 + (c-a)^2}$ का मान है ?

$$\boxed{\text{Ans} = 15}$$

19. यदि $x + \frac{1}{16x} = 1$, तो $64x^3 + \frac{1}{64x^3}$ का मान ज्ञात कीजिये ?

ans = 52

20. यदि $x + \frac{1}{x} = 6$, तो $\frac{3x}{2x^2 + 2 - 5x}$ का मान ज्ञात कीजिये ?

ans = 3/7

21. यदि $\frac{4p}{p^2 - 4p + 4} = \frac{1}{8}$, $p \neq 0$, तो $p + \frac{4}{p}$ का मान होगा ?

ans = 36

22. यदि $x^2 - 3x + 6 = 0$, तो $x^2 + \frac{36}{x^2}$ का मान बताइये ?

ans = -3

23. यदि $4x^2 + y^2 + 4z^2 + 3 = 4z + 2y - 4x$ तो $x + y + z$ का मान ज्ञात कीजिये ?

ans = 1

24. $\frac{3-5x}{x} + \frac{3-5y}{y} + \frac{3-5z}{z} = 0$, तो $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ का मान होगा ?

ans = 5

25. यदि $x^2 - 3x + 1 = 0$ और $x > 1$, तो $\left(x - \frac{1}{x}\right)$ का मान होगा ?

ans = $\pm\sqrt{5}$

26. यदि $x = 2 + \sqrt{3}$, तो $\frac{x^6 + x^4 + x^2 + 1}{x^3}$ का मान ज्ञात कीजिये ?

ans = 56

27. यदि $x^4 + \frac{1}{x^4} = 23$, तो $\left(x - \frac{1}{x}\right)^2$ का मान ज्ञात कीजिये ?

ans = 3

28) यदि x वास्तविक संख्या है और $x^4 + \frac{1}{x^4} = 119$ है तो

$(x - \frac{1}{x})$ का मान ज्ञात कीजिये ?

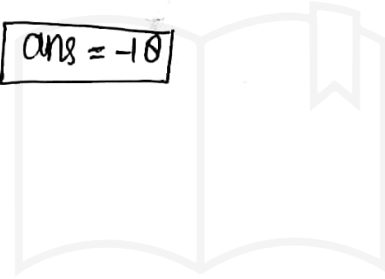
ans = ± 3

29) यदि $a = 3 + 2\sqrt{2}$, तो $\frac{a^6 + a^4 + a^2 + 1}{a^2}$ का मान ज्ञात कीजिये ?

ans = 204

30) यदि $n^2 + 3n + 1 = 0$, तो $n^3 + \frac{1}{n^3}$ का मान ज्ञात कीजिये ?

ans = -10



Toppernotes

Unleash the topper in you

Solution

$$\begin{aligned}
 \textcircled{1} \quad \frac{a^3 + b^3 + c^3 - 3abc}{-(a^2 + b^2 + c^2 - ab - bc - ca)} &= \frac{(a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)}{-(a^2 + b^2 + c^2 - ab - bc - ca)} \\
 &= -(a+b+c) \\
 &= -(-5 - 6 + 10) \\
 &= -(-1) = \boxed{1}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{2} \quad x - \frac{1}{x} &= 6 \\
 \therefore x^2 + \frac{1}{x^2} &= \left(x - \frac{1}{x}\right)^2 + 2 = 6^2 + 2 = 36 + 2 = \boxed{38}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{3} \quad x^2 + \frac{1}{x^2} &= 51 \\
 \therefore x - \frac{1}{x} &= \sqrt{\left(x^2 + \frac{1}{x^2}\right) - 2} = \sqrt{51 - 2} = \sqrt{49} = \boxed{\pm 7}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{4} \quad \left(x - \frac{3}{x}\right)^2 &= \left(x + \frac{3}{x}\right)^2 - 4 \times x \times \frac{3}{x} \\
 \left(x - \frac{3}{x}\right)^2 &= 4^2 - 12 = 16 - 12 = 4
 \end{aligned}$$

$$\left(x - \frac{3}{x}\right)^2 = 4 \Rightarrow \boxed{\left(x - \frac{3}{x}\right) = \pm 2}$$

$$\begin{aligned}
 \textcircled{5} \quad x^3 - \frac{1}{x^3} &= \left(x - \frac{1}{x}\right)^3 + 3\left(x - \frac{1}{x}\right) \\
 &= (6)^3 + 3 \times 6 \\
 &= 216 + 18 \\
 &= \boxed{234}
 \end{aligned}$$

- ⑥ जैसा कि हम जानते हैं, यदि $x + \frac{1}{x} = 2 \Rightarrow x = 1$ जो कि इसे संतुष्ट करता है।

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

Alternatively -

$$\begin{aligned} \therefore x^3 + \frac{1}{x^3} &= \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) \\ &= 2^3 - 3 \times 2 \\ &\Rightarrow 8 - 6 = \boxed{2} \end{aligned}$$

- ⑦ $x + \frac{1}{x} = 2 \Rightarrow x = 1$ (इसे संतुष्ट करता है)

$$\therefore x^{17} + \frac{1}{x^{17}} = 1 + 1 = \boxed{2}$$

⑧ $x + y + z = 15$

$$\Rightarrow (x + y + z)^2 = (15)^2$$

$$\Rightarrow x^2 + y^2 + z^2 + 2(xy + yz + zx) = 225$$

$$\Rightarrow x^2 + y^2 + z^2 = 225 - 2 \times 85 = 225 - 170 = \boxed{55}$$

⑨ $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$$= 576 + 2(50) = 676$$

$$\therefore x + y + z = \pm \sqrt{676} = \boxed{\pm 26}$$

⑩ $5x - \frac{5}{x} = 10$, $x - \frac{1}{x} = 2$

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

$$\boxed{x^2 + \frac{1}{x^2} = 6}$$

$$\textcircled{11} \quad \frac{x}{y} = \frac{\left(\frac{a^2 - 25}{a^2 - 36}\right)}{\left(\frac{a+5}{a+6}\right)} = \frac{\frac{(a+5)(a-5)}{(a+6)(a-6)}}{\frac{(a+5)}{(a+6)}} = \boxed{\frac{a-5}{a-6}}$$

$$\textcircled{12} \quad x = a^{2/3} - a^{-2/3}$$

दोनों पक्षों का घन करने पर -

$$x^3 = (a^{2/3} - a^{-2/3})^2$$

$$x^3 = (a^{2/3})^3 - (a^{-2/3})^3 - 3 \cdot a^{2/3} \cdot a^{-2/3} (a^{2/3} - a^{-2/3})$$

$$\Rightarrow x^3 = a^2 - a^{-2} - 3 \times 1 (x)$$

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

$$\boxed{\text{Ans} = a^2 - \frac{1}{a^2}}$$

$$\textcircled{13} \quad \text{दिया गया व्यंजक - } \frac{x^2 - (y^2 + 2yz + z^2)}{(x^2 + y^2 + 2xy) - z^2}$$

$$= \frac{x^2 - (y+z)^2}{(x+y+z)^2 - z^2} = \frac{[x + (y+z)][x - (y+z)]}{(x+y+z)(x+y-z)}$$

$$= \boxed{\frac{x-y-z}{x+y-z}}$$

⑭ $x = 27$
 $\sqrt[3]{x} + \sqrt[3]{y} = \sqrt[3]{729} \Rightarrow 3 + \sqrt[3]{y} = 9$
 $\Rightarrow \sqrt[3]{y} = 9 - 3 = 6 \quad \therefore y = (6)^3 = \boxed{216}$

⑮
$$\frac{a^3 + b^3 + c^3 - 3abc}{a + b + c}$$

$$= \frac{1}{2} \frac{(a+b+c) [(a-b)^2 + (b-c)^2 + (c-a)^2]}{a+b+c}$$

$$= \frac{1}{2} [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$= \frac{1}{2} [9 + 25 + 1] = \frac{35}{2} = \boxed{17.5}$$

⑯ $(a+b)^2 = a^2 + b^2 + 2ab$
 $\Rightarrow 25 = 13 + 2ab$
 $\Rightarrow 2ab = 25 - 13 = 12$
 $\Rightarrow \therefore (a-b)^2 = a^2 + b^2 - 2ab = 13 - 12 = 1$
 $\Rightarrow \boxed{a-b = 1}$

⑰ $a + \frac{1}{a+2} = 0 \Rightarrow a+2 + \frac{1}{a+2} - 2 = 0$

घन करने पर

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

$\Rightarrow (a+2)^3 + \frac{1}{(a+2)^3} + 3(a+2) \times \frac{1}{(a+2)} \cdot \left(a+2 + \frac{1}{a+2} \right) = 8$

$\Rightarrow (a+2)^3 + \frac{1}{(a+2)^3} + 3 \times 2 = 8$

$\Rightarrow (a+2)^3 + \frac{1}{(a+2)^3} = 8 - 6 = 2 \quad \boxed{ans=2}$

$$\begin{aligned}
 \textcircled{18} \quad a^3 + b^3 + c^3 - 3abc &= (a+b+c)(a^2+b^2+c^2 - ab - bc - ca) \\
 &= \frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]
 \end{aligned}$$

$$\begin{aligned}
 \text{रॉयजक} &= \frac{\frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]}{(ab)^2 + (b-c)^2 + (c-a)^2} \\
 &= \frac{1}{2}(a+b+c) = \frac{1}{2}[25+15-10] = \boxed{15}
 \end{aligned}$$

$$\textcircled{19}. \quad x + \frac{1}{6x} = 1$$

दोनों तरफ 4 से गुणा करने पर-

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

$$\begin{aligned}
 \text{अब} \quad 64x^3 + \frac{1}{64x^3} &= (4x)^3 + \frac{1}{(4x)^3} \\
 &= \left(4x + \frac{1}{4x}\right)^3 - 3\left(4x + \frac{1}{4x}\right) \\
 &= 4^3 - 3 \times 4 \\
 &= 64 - 12 = \boxed{52}
 \end{aligned}$$

$$\textcircled{20} \quad \text{दिया हुआ, } x + \frac{1}{x} = 6,$$

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

$$= \frac{3}{2 \left[x + \frac{1}{x} \right] - 5} = \frac{3}{2 \times 6 - 5} = \boxed{\frac{3}{7}}$$

21) दिया गया व्यंजक - $\frac{p^2 - 4p + 4}{4p} = 8$

$$\Rightarrow \frac{p^2 - 4p + 4}{p} = 32$$

$$\Rightarrow \frac{p^2}{p} - \frac{4p}{p} + \frac{4}{p} = 32$$

$$\Rightarrow p - 4 + \frac{4}{p} = 32$$

$$\Rightarrow p + \frac{4}{p} = \boxed{36}$$

22) $x^2 - 3x + 6 = 0 \Rightarrow x^2 + 6 = 3x$
 दोनों पक्षों को x से भाग करने पर

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

दोनों पक्षों का वर्ग करने पर -

$$\Rightarrow \frac{x^2 + 36}{x^2} = 9 + 2x \cdot \frac{6}{x} = 9$$

$$\Rightarrow x^2 + \frac{36}{x^2} = 9 - 12$$

$$\Rightarrow x^2 + \frac{36}{x^2} = -3$$

$$\boxed{\text{ans} = -3}$$

23) दिया गया व्यंजक - $4x^2 + y^2 + 4z^2 + 3 - 4z + 2y + 4x = 0$

$$\Rightarrow (2x+1)^2 + (y-1)^2 + (2z-1)^2 = 0$$

$$\Rightarrow 2x+1 = 0 \Rightarrow x = -\frac{1}{2}$$

$$y-1 = 0 \Rightarrow y = 1$$

$$x+y+z = -\frac{1}{2} + 1 + \frac{1}{2} = \boxed{1}$$

$$2z-1 = 0 \Rightarrow \boxed{z = \frac{1}{2}}$$

$$\begin{aligned}
 \textcircled{24} \quad & \frac{3-5x}{5} + \frac{3-5y}{y} + \frac{3-5z}{z} = 0 \\
 \Rightarrow & \frac{3}{x} - \frac{5x}{x} + \frac{3}{y} - \frac{5y}{y} + \frac{3}{z} - \frac{5z}{z} = 0 \\
 \Rightarrow & \frac{3}{x} + \frac{3}{y} + \frac{3}{z} - 15 = 0 \\
 \Rightarrow & 3\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) = 15 \\
 \Rightarrow & \boxed{\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 5}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{25} \quad & x^2 - 3x + 1 = 0 \\
 \Rightarrow & x\left(x - 3 + \frac{1}{x}\right) = 0 \quad \Rightarrow \quad x + \frac{1}{x} = 3 \\
 \therefore & \left(x - \frac{1}{x}\right)^2 = \left(x + \frac{1}{x}\right)^2 - 4 \\
 = & 9 - 4 = 5 \\
 \therefore & \boxed{x - \frac{1}{x} = \pm\sqrt{5}}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{26} \quad & \because x = 2 + \sqrt{3} \\
 \therefore & \frac{1}{x} = \frac{1}{2 + \sqrt{3}} = \frac{2 - \sqrt{3}}{(2 + \sqrt{3})(2 - \sqrt{3})} = \frac{2 - \sqrt{3}}{4 - 3} \\
 & = 2 - \sqrt{3} \quad \therefore x + \frac{1}{x} = 4
 \end{aligned}$$

$$\begin{aligned}
 \text{चयनक} &= \frac{x^6 + x^4 + x^2 + 1}{x^3} \\
 &= x^3 + x + \frac{1}{x} + \frac{1}{x^3} = \left(x^3 + \frac{1}{x^3}\right) + \left(x + \frac{1}{x}\right) \\
 &= \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right) + \left(x + \frac{1}{x}\right) = 4^3 - 3 \times 4 + 4 = 64 - 12 + 4 = \boxed{56}
 \end{aligned}$$

$$\begin{aligned}
 \text{(27)} \quad x^4 + \frac{1}{x^4} = 23 &\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 23 \\
 \Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 &= 23 + 2 = 25 \\
 \therefore x^2 + \frac{1}{x^2} = 5 &\quad \therefore \left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2 \\
 &= 5 - 2 = \boxed{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{(28)} \quad x^4 + \frac{1}{x^4} = 119 = a \quad \text{माना} \\
 \therefore x^2 + \frac{1}{x^2} = \sqrt{a+2} = \sqrt{119+2} = \sqrt{121} \\
 = \pm 11 = b \quad \text{माना} \\
 \therefore x - \frac{1}{x} = \pm \sqrt{b-2} \\
 = \pm \sqrt{11-2} = \pm \sqrt{9} \\
 = \boxed{\pm 3}
 \end{aligned}$$

$$\begin{aligned}
 \text{(29)} \quad a = 3 + 2\sqrt{2}, \quad \frac{1}{a} = 3 - 2\sqrt{2} \\
 \left[\because (3)^2 - (2\sqrt{2})^2 = 1 \right] \\
 \therefore a + \frac{1}{a} = 6 \\
 \text{अब, } \frac{a^6 + a^4 + a^2 + 1}{a^3} = \frac{a^6}{a^3} + \frac{a^4}{a^3} + \frac{a^2}{a^3} + \frac{1}{a^3} \\
 = \left(a^3 + \frac{1}{a^3}\right) \left(a + \frac{1}{a}\right) \\
 = \left(a + \frac{1}{a}\right)^3 - 3a \times \frac{1}{a} \left(a + \frac{1}{a}\right) + \left(a + \frac{1}{a}\right) \\
 = (6)^3 - 3 \times 6 + 6 \\
 = 216 - 18 + 6 \\
 = \boxed{204}
 \end{aligned}$$