MATHS

BOOKS - S CHAND IIT JEE FOUNDATION

ALGEBRAIC EXPRESSIONS AND IDENTITIES

Solved Examples

1. What should be added to product of $\left(x^2 + xy - y^2\right)$ and $\left(x^2 - xy + y^2\right)$ to get $x^2 y^2$

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2. What is the quotien when $\left(a^4 - b^4\right)$ is divided by a - b ?

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3. $2x + 3y = 6\sqrt{3}$ and $2x - 3y = 6$, find the value of xy ?

4. If $x = 3 + 2\sqrt{2}$, find the value $\sqrt{x} - \dfrac{1}{\sqrt{x}}$

5. if $x^4 + \dfrac{1}{x^4} = 322$ then find the value of $x^3 - \dfrac{1}{x^3}$

6. Find the value of $\left(25a^2 + 16b^2 + 9 + 40ab - 24b - 30a\right)$ at $a = -1$ and $b = 2$.

7. Simplify, $(x - y)^2 + (x - y) - 6x(x^2 - y^2)$

8. Find the product

$(2a + 3b - 4c)(4a^2 + 9b^2 + 16c^2 - 6ab + 12bc + 8ca)$

9. If $a + b + c = 0$ find $\dfrac{a^2}{bc} + \dfrac{b^2}{ca} + \dfrac{c^2}{ab} = ?$

10. If $x + y + z = 1$, $xy + yz + zx = -1$ and $xyz = -1$, find the value of $x^3 + y^3 + z^3$

11. If $ab + bc + ca = 0$, then the value of

$$\frac{1}{a^2 - bc} + \frac{1}{b^2 - ca} + \frac{1}{c^2 - ab} \text{ will be :}$$

12. If $(x + y)^2 = 21 + z^2$, $(y + z)^2 = 32 + x^2$ and $(z + x)^2 = 28 + y^2$

, find $x + y + z$=?

Question Bank

1. Which of the following expressions are exactly equal in value ?

1. $(3x - y)^2 - (5x^2 - 2xy)$

2. $(2x - y)^2$

3. $(2x \pm y)^2 - 2xy$

4. $(2x + 3y)^2 - 2xy$

A. 1 and 2 only

B. 1, 2 and 3 only

C. 2 and 4 only

D. 1,2 and 4 only

Answer: D

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2. What will be the value of

$n^4 - 10n^3 + 36n^2 - 49n + 24$ if n =1 ?

A. 21

B. 2

C. 1

D. 22

Answer: B

3. If $x + y + z = 0$, then $x^2 + xy + y^2$ equals $y^2 + yz + z^2$ (b) $y^2 - yz + z^2$ (c) $z^2 - zx + x^2$ (d) $z^2 + zx + x^2$

A. $y^2 + yz + z^2$

B. $y^2 - yz + z^2$

C. $z^2 - xy$

D. $z^2 + zx + x^2$

Answer: C

4. if $a - b = 3$ and $a^3 - b^3 = 117$ then $a + b$ is

A. ± 7

B. 49

C. 0

D. ± 13

Answer: A

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5. If $a + b + c = 0$, then what is the value of $(a + b - c)^3 + (c + a - b)^3 + (b + c - a)^3$?

A. $-8(a^3 + b^3 + c^3)$

B. $a^3 + b^3 + c^3$

C. $24abc$

D. $-24abc$

Answer: D

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6. If $a^{1/3} + b^{1/3} + c^{1/3} = 0,$ then the value of $(a + b + c)^3$ will be:

A. $9a^2b^2c^2$

B. $3abc$

C. $6abc$

D. $27abc$

Answer: D

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7. What is the value of the expression $(1 + x)(1 + x^2)(1 + x^4)(1 + x^8)(1 - x)$? $x^8 + 1$ (b) $x^{16} - 1$ (c) $1 + x^{16}$ (d) $1 - x^{16}$

A. $1 + x^{16}$

B. $1 - x^{16}$

C. $x^{16} - 1$

D. $x^8 + 1$

Answer: B

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8. Polynomial which when divided by $\left(- x^2 + x - 1 \right)$ gives a quotient $(x - 2)$ and remainder 3 is $x^3 - 3x^2 + 3x - 5$

A. $x^3 - 2$

B. $x^3 - 1$

C. $x^3 + 2$

D. $\left(x^3 + 4 \right)$

Answer: D

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9. Divide the polynomial $3x^4 - 4x^3 - 3x - 1$ by $x - 1$

A. 0

B. 5

C. -5

D. 5

Answer: C

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10. If $a = \dfrac{x}{x+y}$ and $b = \dfrac{y}{x-y}$, then $\dfrac{ab}{a+b}$ is equal to $\dfrac{xy}{x^2+y^2}$ (b) $\dfrac{x^2+y^2}{xy}$ (c) $\dfrac{x}{x+y}$ (d) $\left(\dfrac{y}{x+y}\right)^2$

A. $\dfrac{xy}{x^2+y^2}$

B. $\dfrac{x^2+y^2}{xy}$

C. $\dfrac{x}{x+y}$

D. $\left(\dfrac{y}{x+y} \right)^2$

Answer: A

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11. If $a^2 + b^2 = 117$ and $ab = 54$, then find the value of $\dfrac{a+b}{a-b}$.

A. 3

B. 5

C. 6

D. 4

Answer: B

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12. If $a^2 + \dfrac{1}{a^2} = 10$, then the value of $a^4 + \dfrac{1}{a^4}$ is

A. 90

B. 98

C. 200

D. 196

Answer: B

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13. If $\left(a^4 + \dfrac{1}{a^4} \right) = 1154$, then the value of $\left(a^3 + \dfrac{1}{a^3} \right) = ?$ (a) 198 (b) 200 (c) 216 (e) None of these

A. 198

B. 216

C. 200

D. 196

Answer: A

14. If $\left(x + \dfrac{1}{x} \right) = 3$, then the value of $\left(x^6 + \dfrac{1}{x^6} \right)$ is (a) 322 (b) 364 (c) 414 (d) 927

A. 927

B. 414

C. 364

D. 322

Answer: D

15. If $a + b + c = 0.$ then the value of

$a^2(b + c) + b^2(c + a) + c^2(a + b)$ is :

A. abc

B. 3 abc

C. $-3abc$

D. 0

Answer: C

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16. If $x = 3^{1/3} + 3^{-1/3}$, then $3x^3 - 10$ is equal to

A. $-3x$

B. $3x$

C. $-9x$

D. 9x

Answer: D

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17. If a,b,c are real and distinct nubmer , then the value of $\dfrac{(a-b)^3 + (b-c)^3 + (c-a)^3}{(a-b)(b-c)(c-a)}$ is

A. 1

B. 3

C. $\dfrac{1}{3}$

D. zero

Answer: B

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18. If $a+b+c = 11$ and $ab+bc+ca = 20$, then the value of the expression $a^3 + b^3 + c^3 - 3abc$ will be (a) 121 (b) 341 (c) 671 (d) 781

A. 121

B. 341

C. 671

D. 781

Answer: C

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19. The value of $\dfrac{x^2 - (y - z)^2}{(x + z)^2 - y^2} + \dfrac{y^2 - (x - z)^2}{(x + y)^2 - z^2} + \dfrac{z^2 - (x - y)^2}{(y + z)^2 - x^2}$ is

-1 (b) 0 (c) 1 (d) None of these

A. -1

B. 0

C. 1

D. 2

Answer: C

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20. If $2a - \dfrac{1}{2a} = 3,$ then $16a^4 + \dfrac{1}{16a^4}$ is equal to

A. 11

B. 119

C. 117

D. 121

Answer: B

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21. The value of the product $\left(7 - \dfrac{12}{x}\right)\left(49 + \dfrac{84}{x} + \dfrac{144}{x^2}\right) at x = 2$ is

A. 0

B. 559

C. 127

D. 128

Answer: C

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22. The value of $64a^3 + 48a^2b + 12a^2b + b^3$ at a =1 and b =-1 is

A. 25

B. 125

C. 27

D. 54

Answer: C

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23. Evaluate:

$$\frac{(0.43)^3 + (1.47)^3 + (1.1)^3 - 3 \times 0.43 \times 1.47 \times 1.1}{\left((0.43)^2 + (1.47)^2 + (1.1)^2 - 0.43 \times 1.43\right) - 0.43 \times 1.1 - 1.47 \times 1.1}$$

A. 1.90

B. 2.87

C. 3

D. 3.47

Answer: C

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24. If $\dfrac{x^2 + y^2 + z^2 - 64}{xy - yz - zx} = -2$ and $x + y = 3z$, then the value of z is

(a) 2 (b) 3 (c) 4 (d) None of these

A. 2

B. 3

C. 4

D. -2

Answer: C

25. If $\left(a^2 + b^2\right)^3 = \left(a^3 + b^3\right)^2$ and $ab \neq 0$, then $\left(\dfrac{a}{b} + \dfrac{b}{a}\right)^6$ is equal to

A. $\dfrac{a^6 + b^6}{a^3 b^3}$

B. $\dfrac{64}{729}$

C. 1

D. $\dfrac{a^6 + a^3 b^3 + b^6}{a^2 b^4 + a^4 b^2}$

Answer: B

Self Assessment Sheet

1. Each of the following is a term in the polynomial which is the product of $(x + 1)$, $(3x^2 + 6x)$ and $(2x^2 + 6x - 1)$ except.

A. $6x^5$

B. $36x^4$

C. $-6x$

D. -1

Answer: D

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2. If $4x^2 + x(m + 1) + 1$ is a perfect square, then a value of m is :

A. -5

B. 5

C. 3

D. -3

Answer: C

3. $\dfrac{1}{2}(a + b)(a^2 + b^2) + \dfrac{1}{2}(a - b)(a^2 - b^2)$ is equal to

A. $a^3 - b^3$

B. $a^3 + 3a^2b + 3ab^2 + b^3$

C. $a^3 + b^3$

D. $a^3 - 3ab(a + b) - b^3$

Answer: C

4. If $x = \dfrac{1 + 2y}{2 + y}$ and $y = \dfrac{1 + 2t}{2 + t}$, then x equals

A. $\dfrac{1+2t}{3+t}$

B. $\dfrac{3+2t}{2+3t}$

C. $\dfrac{5t+4}{4t+5}$

D. $\dfrac{5t+6}{6t+5}$

Answer: C

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5. Simplify : $\dfrac{3y(x-y)-2x(y-2x)}{7x(x-y)-3(x^2-y^2)}$

A. $\dfrac{x-y}{x+y}$

B. 1

C. $\dfrac{x+y}{x-y}$

D. 0

Answer: C

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6. The difference between any number of four digits and the number formed by using the digits in the reversed order is exactly divisible by :

A. 11

B. 10

C. 9

D. 5

Answer: C

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7. If "from the square of a half the sum of two numbers we subtract the square of a half their difference ", the result is the :

A. sum of the two numbers

B. quotient of the two numbers

C. difference of the two numbers

D. product of the two numbers

Answer: D

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8. The value of the expression

$$\frac{\left(x^2 - y^2\right)^3 + \left(y^2 - z^2\right)^3 + \left(z^2 - x^2\right)^3}{\left(x - y\right)^3 + \left(y - z\right)^3 + \left(z - x\right)^3} \text{ is}$$

A. $\left(x^2 - y^2\right)\left(y^2 - z^2\right)\left(z^2 - x^2\right)$

B. $3(x - x)(y - z)(z - x)$

C. $(x + y)(y + z)(z + x)$

D. $(3(x + y)(y + z)(z + x)$

Answer: C

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9. If $x = 2a - 1, y = (2a - 2)$ and $z = 3 - 4a$, then the value of $x^3 + y^3 + z^3$ will be :

A. $6(3 - 13a + 18a^2 - 8a^3)$

B. $6(3 + 13a - 18a^2 + 8a^3)$

C. $6(3 + 13a + 18a^2 - 8a^3)$

D. $6(3 - 13a - 18a^2 - 8a^3)$

Answer: A

10. if $(5x^2 + 14x + 2)^2 - (4x^2 - 5x + 7)^2$ is divided by $x^2 + x + 1$, then quotient q and remainder r are given by

A. $q = (x^2 + 19x - 5), r = 1$

B. $q = 9(x^2 + 19x - 5), r = 0$

C. $q = (x^2 + 19x - 5), r = 0$

D. $q = 9(x^2 + 19x - 5), r = 1$

Answer: C

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