Expected Algebra Questions for Railway Exams

ELEMENTARY ALGEBRA FOR RRB NTPC EXAMS

1) Find the sum of m + n if x + 2 is factor of $x^3 + mx^2 + nx + 6$ and $mx + 6$

a) – 5

b) 5

c) – 8

d) 8

2) Find the factor of the polynomial: $x^3 – 13x^2 + 24x – 12$.

a) $x^2 – 12x + 12$

b) $x^2 – 14x + 48$

c) $x^2 – 12x + 36$

d) None of the above

3) If $16p^2 + 4q^2 + 9r^2 – 16pq + 12qr – 24pr = 0$ and $p = - 1$ then find the value of $2q + 3r$

a) 3

b) –3

c) –4

d) 4

4) If $4x^2 + 16y^2 + 12x + 24y + 18 = 0$ then find the value of $x^3 – y^4$

a) -945/256

b) 945/256

c) -455/236

d) 455/236

5) If $8a^3 + 125b^3 + 60a^2b + 150ab^2 = 0$ then find the value of a/b

a) 5/2

b) 2/5

c) -5/2

d) -2/5

6) If $x^2 + y^2 + z^2 = xy + yz + zx$ & $x/y = z$, then find the value of $x^3+y^3+z^3$

a) $3x^2$

b) $-2y^2$

c) 0

d) 1

7) The sum and product of two numbers is 54 and 713. Find the difference between those two numbers.

a) 8

b) 6

c) 7

d) 9

8) If x + y + z = 21 then the maximum value of (x – 6)(y + 7)(z – 4) is

a) 343

b) 216

c) 125

d) Can't be determined

9) If $x^2 + 1/x^2 = 7$ then find the value of x^3+1/x^3 (x>0)

a) 15

b) 14

c) 18

d) 16

10) If $x - \sqrt{x} = 132$ then find the value of x

a) 144

b) 196

c) 169

d) 121

11) Find the value of (5.29 + 3.24 + 8.28)/(5.29 – 3.24)

a) 6.8

b) 7.8

c) 7.6

d) 8.2

12) If a = 208, b = 312 and c = 405 then find the value of $a^3 + b^3 + c^3 – 3abc/(a^2 + b^2 + c^2 – ab – bc – ca)$

a) 725

b) 1

c) 625

d) 925

13) If (y – x)/(y + x) = 2, then find the value of y in terms of x

a) -2x

b) 2x

c) -3x

d) None of the above

14) If $x = 9 – 4\sqrt{5}$ then find the value of $\sqrt{x}+1/\sqrt{x}$

a) 1

b) $2\sqrt{5}$

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c) $3\sqrt{5}$

d) $4\sqrt{5}$

15) If p + q + 2 = 0 then find the value of $p^3+q^3+8-6pq$

a) 24

b) 36

c) 0

d) 42

16) If xy = 0 and x/y = 1/2, then find the value of $(x^3+y^3)/(x^2+y^2)$

a) 0

b) 3x

c) 1

d) 3y

17) If x + 4/x = 4, then find the value of x^5+1/x^3

a) 257/8

b) 235/8

c) 247/7

d) 247/6

18) If the roots of the quadratic equation $3x^2 – 6x + p = 0$ are real and equal then find the value of p.

a) 4

b) 3

c) 2

d) 8

19) If $(a + b – c)^2 = 16(a – c) + (b + c – a)^2$ then find the value of b

a) 8

b) 16

c) 12

d) 4

20) Find the quadratic equation whose roots are 1/p and 1/q

a) $pqx^2 - (p + q)x + 1 = 0$

b) $x^2 - (p + q)x + 1/pq = 0$

C) $pqx^2 - (p + q)x + 1/pq = 0$

d) None of the above

21) Find the sum of the factors of the equation $2x^2 – 7x + 3 = 0$

a) 7

b) -7

c) 3x – 4

d) 2x – 6

22) If A and B are positive roots of quadratic equation and $(A + B)^2 = 729$ and $(A – B)^2 = 225$, then find the quadratic equation whose roots are A and B

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a) $x^2 - 27x + 126$

b) $x^2 - 24x + 144$

c) $x^2 - 28x + 192$

d) None of the above

23) If $x + 1/x = \sqrt{3}$, then find the value of $x^6 + 1/x^{12}$

a) 2

b) -2

c) 0

d) $\sqrt{3}$

24) If a + b + c + d = 2 then find the maximum value of (ab + bc + cd + da)

a) 12

b) 1

c) -1

d) 14

25) If $x + (1/(x + 1)) = 1$, then find the value of $(x+1)^3+1/(x+1)^7$

a) 57/13

b) 54/15

c) 2

d) 0

26) If $p + (1/p) + 2 = 0$ then find the value of $(p + 2)^2+1/ (p + 2)^4$

a) 12

b) –12

c) 2

d) –2

27) If $x - 1/x = 7$ then find the value of $x^2 + 1/x^2$

a) 51

b) 47

c) 0

d) 2

28) If $7p + 1/6p = \sqrt{5}$ then find the value of $49p^2 + (1/36p^2) + 1$

a) 11/3

b) 5

c) 13/3

d) 0

29) If $x + 1/4x = 6$ then find the value of $16x^2 + 1/x^2$

a) 124

b) 576

c) 568

d) 128

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30) Solve: $2^{16} - 255(2^8 + 1)$

a) 1

b) -12234

c) -2346s

d) None of the above

31) Solve: [(a - b)/(a + b)] – [(a + b)/(a – b)]

a) $4ab/(a^2 - b^2)$

b) 0

c) $-4ab/(a^2 - b^2)$

d) $2(a^2+b^2)/(a^2 - b^2)$

32) Solve: [(√6 + 1)/ (√6 – 1)] + [(√6 – 1)/ (√6 + 1)]

a) -12/5

b) 12/5

c) -14/5

d) 14/5

33) If x = (1 + √2)/ (1 - √2) and y = (1 - √2)/ (1 + √2) then find the value of x/y – y/x

a) $-24\sqrt{2}$

b) $24\sqrt{2}$

c) $12\sqrt{2}$

d) $-12\sqrt{2}$

34) If a + b = 4 and ab = 1 then find the value of $(a^2 + ab + b^2)/(a^2 - ab + b^2)$

a) -7/6

b) 7/6

c) -15/13

d) 15/13

35) If $a^3 - b^3 = 26$ and $(a + b)^2 = 13 + ab$, then find the value of (a – b)

a) 1

b) 2

c) -2

d) 0

36) If p = √5 + (1/√5) and q = √5 - (1/√5) then find the value of $p^3 + q^3$

a) $47/\sqrt{5}$

b) $46/\sqrt{5}$

c) $57/\sqrt{5}$

d) $56/\sqrt{5}$

37) If a + b = -c, then find the value of $a^3 + b^3 + c^3 - 3abc$

a) 0

b) 6abc

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c) -3abc

d) -1

38) Simplify: $(x^2 + 8x + 16)/(x^2 + 6x + 8)$

a) (x + 4)/(x + 3)

b) (x + 6)/(x + 3)

c) (x + 4)/(x + 2)

d) None of the above

39) If a and b are non-zero rational unequal numbers, then

$[(a - b)^2 - (a + b)^2]/a^2b – ab^2$ is equal to

a) ab/(a – b)

b) -4/(a – b)

c) 0

d) -1/(a – b)

40) If a + b + c = 10, $a^2 + b^2 + c^2 = 64$ and 1/a + 1/b + 1/c = 2 then find the value of abc

a) 6

b) ab + bc + ca

c) abc

d) 9

41) If $a^4 – b^4 = 65$ and $a^2 – b^2 = 5$ then find the value of $a^2 + b^2$

a) 12

b) 15

c) 0

d) 13

42) Find the remainder when $x^4 – 2x^3 + 3x^2 – 5x – 8$ is divided by x – 2

a) 0

b) -6

c) 3

d) - 4

43) If $x^2 – 3x – 1 = 0$ then find the value of $x^3 – 1/x^3$

a) 36

b) -18

c) 18

d) 0

44) If x + y = 12 and xy = 11 then find $x^2 – y^2$

a) 64

b) 56

c) 110

d) 120

45) If x – 1/x = 3 then find the value of x^2+1/x^2

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a) 13

b) 15

c) 11

d) 14

46) If $x^2 + 1/x^2 = \sqrt{3}$, then find the value of $x^{36} + 1/x^{24}$

a) 3

b) -1

c) 2

d) 0

47) If $x^3 = -1$ then find the value of $x^{54} + x^{51}$

a) 2

b) 0

c) – 2

d) 4

48) If $a/b = 1 - b/a$ then find the value of $a^3 + b^3$

a) 0

b) ab

c) a + b

d) – 1

49) If $x = 11 + 6\sqrt{2}$, then find the value of $\sqrt{x} + 1/\sqrt{x}$

a) 4

b) $3 + 4\sqrt{2}$

c) $(24 + 6\sqrt{2})/7$

d) 0

50) If $a(2 - \sqrt{3}) = b(2 + \sqrt{3}) = 1$ then find the value of $1/a + 1/b$

a) 5

b) 4

c) 0

d) -1

ANSWERS

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1) Answer: D

Solution:

Consider the expressions as f(x) and g(x) respectively

$f(x) = x^3 + mx^2 + nx + 6$

And, $g(x) = mx + 6$

Since, $x + 2$ is factor of $x^3 + mx^2 + nx + 6$ and $mx + 6$

$f(x) = 0$ and $g(x) = 0$

Then for $x = -2$,

$f(-2) = (-2)^3+m(-2)^2+n(-2)+6=0$

$4m-2n = 2$ --- (1)

$g(-2) = -2m+6 = 0$

$m = 3$

Put the value of m in (1)

(1)=> $12-2n=2$

$N = 5$

$M + n = 8$

2) Answer: A

Solution:

$= x^3 – 13x^2 + 24x – 12$

$= x^3 – x^2 – 12x^2 + 12x + 12x – 12$

$= x^2(x-1)-12x(x-1) +12(x-1)$

$= (x-1)(x^2-12x+12)$

Therefore, $(x^2 – 12x + 12)$ is a factor of the given polynomial.

3) Answer: C

Solution:

$16p^2 + 4q^2 + 9r^2 – 16pq + 12qr – 24pr = 0$

Comparing the above expression with the algebraic identity

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

As terms containing p is negative then p is negative

$(-4p)^2 + (2q)^2 + (3r)^2 + 2(-4p)(2q) + 2(2q)(3r) + 2(-4p)(3r) = 0$

$(-4p+2q+3r)^2 = 0$

$2q + 3r = 4p$

Since $p = -1$,

$2q + 3r = -4$

4) Answer: A

Solution:

$4x^2 + 16y^2 + 12x + 24y + 18 = 0$

$4x^2 + 12x + 9 + 16y^2 + 24y + 9 = 0$

$(2x + 3)^2+ (4y + 3)^2 = 0$

The above expression is 0 only when both terms are 0

$2x + 3 = 0$;

$4y + 3 = 0$

$X = -3/2$, $y = -3/4$

$x^3 = -27/8$

$y^4 = 81/256$

$x^3 – y^4 = -27/8 – 81/256$

$= (-864 – 81)/256 = -945/256$

5) Answer: C

Solution:

$8a^3 + 125b^3 + 60a^2b + 150ab^2 = 0$

The above expression is of the form

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

$(2a)^3 + (5b)^3 + 3(2a)^2(5b) + 3(2a)(5b)^2 = 0$

$(2a + 5b)^3 = 0$

$2a + 5b = 0$

$2a = - 5b$

$a/b = -5/2$

6) Answer: A

Solution:

As, $x^3 + y^3 + z^3 – 3xyz = (x + y + z)(x^2 + y^2 + z^2 – xy – yz – zx)$ --- (1)

Given: $x^2 + y^2 + z^2 = xy + yz + zx$

(1) => $x^3 + y^3 + z^3 – 3xyz = 0$

$x^3 + y^3 + z^3 = 3xyz$ --- (2)

Since $x/y = z$

(2)=> $x^3 + y^3 + z^3 = 3x^2$

7) Answer: A

Solution:

The given question can be expressed in the form of quadratic equation

As, x^2 - (sum of the terms) + product of the terms =0

$x^2 – 54x + 713 = 0$

Factors of the above expression will be the required numbers

On solving the above quadratic equation

$x^2 – 31x – 23x + 713 = 0$

$x (x - 31) – 23 (x – 31) = 0$

$x – 31 = 0$; $x – 23 = 0$

The numbers are 23, 31

Difference between the two number = 31 – 23 = 8

Alternative Method

$(x-y)^2=x^2+y^2-2xy$

$(x-y)^2=x^2+y^2-2xy+2xy-2xy$

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

$(x-y)^2=54^2-4*713$

$(x-y)^2=2916-2852=64$

$x-y=8$

8) Answer: B

Solution:

$(x – 6)(y + 7)(z – 4)$ is maximum, only when $(x – 6) = (y + 7) = (z – 4)$

Let $(x – 6) = (y + 7) = (z – 4) = k$

$X = k + 6$

$Y = k – 7$

$Z = k + 4$

$K + 6 + k – 7 + k + 4 = 21$

$3k + 3 = 21$

$k = 6$

$(x – 6)(y + 7)(z – 4) = k^3$(since each term is equal to k)

$= 6^3 = 216$

9) Answer: C

Solution:

$x^2 + 1/x^2 = 7$

$x^2 + 1/x^2 + 2 = 7 + 2$

$(x + 1/x)^2 = 9$

$X + 1/x = 3$ (As $x > 0$, So $– 3$ is neglected)

$x^3+1/ x^3=(x+1/x)^3-3(x)(1/x)(x+1/x)$

$x^3 + 1/ x^3 = 3^3 – 3(3) = 18$

10) Answer: A

Solution:

$X - \sqrt{x} = 132$

$X – 132 = \sqrt{x}$

Squaring on both sides

$x^2 – 264x + 17424 = x$

$x^2 – 265x + 17424 = 0$

$(x – 121)(x – 144) = 0$

$X = 121,144$

By applying the values of x,

For $x = 121$

$121 – 11 \neq 132$

For $x = 144$

$144 – 12 = 132$

So value of $x = 144$

$144-\sqrt{144}=132$

144-12=132

(or)

By applying the options, one can find the answer

11) Answer: D

Solution:

= (5.29+3.24+8.28)/(5.29-3.24)

Numerator and denominator is of the form (a^2+b^2+2ab) and (a^2-b^2) respectively

= $(2.3^2+1.8^2+2(2.3*1.8))/(2.3^2-1.8^2)$

= $(2.3+1.8)^2/(2.3+1.8)(2.3-1.8)$

= (2.3+1.8)/0.5

= 4.1/0.5 = 8.2

12) Answer: D

Solution:

=$a^3 + b^3 + c^3 – 3abc/(a^2 + b^2 + c^2 – ab – bc – ca)$

As, $a^3 + b^3 + c^3 – 3abc = (a + b + c)(a^2 + b^2 + c^2 – ab – bc – ca)$

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

= a + b + c

= 208 + 312 + 405 = 925

13) Answer: C

Solution:

(y – x)/(y + x) = 2/1

By componendo and dividendo method

2y/(-2x) = 3/(1)

-y/x = 3/1

Y = -3x

(or)

(y – x)/(y + x) = 2

Y – x = 2(y + x)

Y – x = 2y + 2x

-y = 3x

Y = - 3x

14) Answer: B

Solution:

=√x+1/√x

Squaring the above expression

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

$X = 9 – 4\sqrt{5}$

$1/x = 1/(9 – 4\sqrt{5})$

My taking complex conjugate

$1/x = (9+4\sqrt{5})/(81-80)= 9+4\sqrt{5}$

(1)=> $(\sqrt{x}+1/\sqrt{x})^2 = 9 - 4\sqrt{5} + 9 + 4\sqrt{5} + 2 = 20$

$\sqrt{x}+1/\sqrt{x} = \sqrt{20} = 2\sqrt{5}$

Another Method:

$X = 9 - 4\sqrt{5} = 5+4-2(2)(\sqrt{5}) = (\sqrt{5})^2+2^2-2(2)(\sqrt{5})$

The above expression is of the form, $(a + b)^2=a^2+b^2+2ab$

$(\sqrt{5})^2+2^2-2(2)(\sqrt{5}) =(2+\sqrt{5})^2$

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

$1/\sqrt{x} =1/2+\sqrt{5}$

Taking complex conjugate

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

$\sqrt{x}+1/\sqrt{x} =2+\sqrt{5} -2+\sqrt{5}=2\sqrt{5}$

15) Answer: C

Solution:

This expression $(p^3 + q^3 + 8 - 6pq)$ can be rewritten as,

$= p^3 + q^3 + 2^3 - 3(2pq)$

If $a + b + c = 0$, then $a^3 + b^3 + c^3 - 3abc = 0$

Since, $p + q + 2 = 0$ then $p^3 + q^3 + 8 - 6pq = 0$

16) Answer: B

Solution:

$= (x^3+y^3)/(x^2+y^2)$

$= (x + y)(x^2 - xy + y^2)/ (x^2 + y^2)$

Put $xy = 0$

$(x^3 + y^3)/(x^2 + y^2) = x + y$ --- (1)

Since, $y = 2x$

(1)=> $(x^3 + y^3)/(x^2+y^2) = 3x$

17) Answer: A

Solution:

$X + 4/x = 4$

$x^2 - 4x + 4 = 0$

$(x - 2)^2 = 0$

$X = 2$

$x^5 + 1/x^3 = 2^5 + 1/2^3$

$= 32 + 1/8$

$= (256 + 1)/8$

$= 257/8$

18) Answer: B

Solution:

If the roots of the quadratic equation are real and equal then

$b^2 - 4ac = 0$ --- (1)

Then in the given quadratic equation $3x^2 - 6x + p = 0$

$a = 3, b = - 6, c = p$

(1)=> $(-6)^2 - 4(3)(p) = 0$

$36 - 12p = 0$

$P = 3$

19) Answer: D

Solution:

$(a + b - c)^2 = 16(b - c) + (b + c - a)^2$

$a^2 + b^2 + c^2 + 2ab - 2bc - 2ca = 16(b - c) + a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$

$4b(a - c) = 16(a - c)$

$B = 4$

20) Answer: A

Solution:

The general form of quadratic equation:

x^2 - (sum of the roots)x + product of the roots = 0

$x^2 - (1/p + 1/q)x + 1/pq = 0$

$x^2 - ((p + q)/pq)x + 1/pq = 0$

$pqx^2 - (p + q)x + 1 = 0$ is the required equation

21) Answer: C

Solution:

$2x^2 - 7x + 3 = 0$

$2x^2 - 6x - x + 3 = 0$

$2x(x - 3) - (x - 3) = 0$

$(2x - 1)(x - 3) = 0$

Therefore the factors are $(2x - 1)$ and $(x - 3)$

Sum of the factors = $2x - 1 + x - 3 = 3x - 4$

22) Answer: A

Solution:

The general form of quadratic equation:

x^2 - (sum of the roots)x + product of the roots = 0

Since roots are A and B

Sum of the roots = A + B

Product of roots = AB

$(A+B)^2 = 729$

$A+B = \pm 27$

Since A and B are positive roots A + B should be positive which is equal to 27

A + B = 27 --- (1)

$(A - B)^2 = 225$

$A - B = \pm 15$

A – B = 15 --- (2)

On solving (1) and (2)

A = 21 and B = 6

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The required quadratic equation

$x^2 - 27x + 126 = 0$

23) Answer: C

Solution:

$X + 1/x = \sqrt{3}$

Cubing on both sides

$x^3 + 1/x^3 + 3(x)(1/x)(x+1/x) = 3\sqrt{3}$

$x^3 + 1/x^3 + 3\sqrt{3} = 3\sqrt{3}$

$x^3 + 1/x^3 = 0$

$x^6 = -1$

$x^6 + 1/x^{12} = -1 + 1/(-1)^2 = 0$

24) Answer: B

Solution:

$a + b + c + d = 2$

To get the maximum all a, b, c and d should be equal

Therefore, $a = b = c = d = 1/2$

$(ab + bc + cd + da) = (1/4 + 1/4 + 1/4 + 1/4) = 1$

25) Answer: C

Solution:

$X + (1/(x + 1)) = 1$

Adding 1 on both sides

$(x + 1) + 1/(x + 1) = 2$

The above expression is of the form $a + 1/a = 2$

$a = 1$ satisfies the above expression

Since $a = x + 1$, $x = 0$

Therefore, $(x + 1)^3 + 1/(x + 1)^7 = 2$

26) Answer: C

Solution:

$P + 1/p + 2 = 0$

$P + 1/p = -2$ –-- (1)

$p^2 + 2p + 1 = 0$

$(p + 1)^2 = 0$

$P = -1$

(Or) by analyzing the expression (1), we can directly conclude that p=-1

$(p+2)^2 + 1/(p+2)^4 = (1)^2+1/(1)^4 = 2$

27) Answer: A

Solution:

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

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

$x^2 + 1/x^2 = 49 + 2 = 51$

28) Answer: A

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Solution:

$7p + 1/6p = \sqrt{5}$

Squaring on both sides

$(7p + 1/6p)^2 = 5$

$49p^2 + (1/36p^2) + 7/3 = 5$

$49p^2 + (1/36p^2) + 3/3 + 4/3 = 5$

$49p^2 + (1/36p^2) + 1 = 5 – 4/3$

$49p^2 + (1/36p^2) + 1 = 11/3$

29) Answer: C

Solution:

$x + 1/4x = 6$

Multiply by 4 on both sides

$4x + 1/x = 24$

Squaring on both sides

$(4x + 1/x)^2 = 24^2$

$16x^2 + 1/x^2 + 2(4x)(1/x) = 576$

$16x^2 + 1/x^2 = 568$

30) Answer: A

Solution:

$=2^{16} – 255(2^8 + 1)$ ------ (1)

255 can be rewritten as $256 – 1 = 2^8-1$

(1) => $2^{16} – (2^8-1) (2^8+1)$

$= 2^{16} – (2^8-1) (2^8+1)$ --- (2)

Apply $a^2-b^2= (a + b) (a – b)$ for $(2^8 - 1) (2^8 + 1)$

(2)=> $2^{16} – (2^{16}-1)$

$= 1$

31) Answer: C

Solution:

$= (a – b)/(a + b) - (a + b)/(a – b)$

$= [(a – b)^2 – (a + b)^2]/[(a + b)(a – b)]$

$= [a^2 + b^2 – 2ab – a^2 – b^2 – 2ab]/[a^2 – b^2]$

$= -4ab/(a^2 – b^2)$

32) Answer: D

Solution:

$= [(\sqrt{6} + 1)/(\sqrt{6} – 1)] + [(\sqrt{6} – 1)/ (\sqrt{6} + 1)]$

$= [(\sqrt{6}+1)^2+(\sqrt{6}-1)^2]/[(\sqrt{6})^2-1^2]$

$= (6 + 1 + 2\sqrt{6} + 6 + 1 – 2\sqrt{6})/(6-1)$

$= 14/5$

33) Answer: B

Solution:

$= x/y – y/x$

$= (x^2 – y^2)/xy$ --- (1)

$X = (1+\sqrt{2})/(1-\sqrt{2})$

Taking complex conjugate

$X = (1+\sqrt{2})^2/((1+\sqrt{2})(1-\sqrt{2})) = (1+2+2\sqrt{2})/(-1)$

$X = -(3 + 2\sqrt{2})$

$x^2 = [-(3 + 2\sqrt{2})]^2 = 9 + 8 + 12\sqrt{2} = 17 + 12\sqrt{2}$

$y = (1 - \sqrt{2})/(1 + \sqrt{2})$

Taking complex conjugate

$y = [(1 - \sqrt{2})(1 - \sqrt{2})]/[(1 + \sqrt{2})(1 - \sqrt{2})] = (1 - \sqrt{2})^2/(1 – 2) = (1 + 2 – 2\sqrt{2})/(-1)$

$y = 2\sqrt{2} – 3$

$y^2 = (2\sqrt{2} – 3)^2 = 8 + 9 – 12\sqrt{2} = 17 – 12\sqrt{2}$

$xy = -(2\sqrt{2} + 3)(2\sqrt{2} – 3) = -(8 – 9) = 1$

$(1) \Rightarrow (17 + 12\sqrt{2} – 17 + 12\sqrt{2})/1 = 24\sqrt{2}$

34) Answer: D

$= (a^2 + ab + b^2)/(a^2 – ab + b^2)$

By using algebraic identities the numerator and denominator becomes

$= [(a + b)^2 – ab]/[(a + b)^2 – 3ab]$ –----- (1)

Put the values of a + b and ab

$(1) \Rightarrow [4^2 – 1]/[4^2 – 3] = 15/13$

35) Answer: B

Solution:

Given:

$a^3 – b^3 = 26$

$(a + b)^2 = 13 + ab \Rightarrow a^2 + b^2 + 2ab = 13 + ab$

$\Rightarrow a^2 + b^2 + ab = 13$

As we know that,

$a^3 – b^3 = (a – b)(a^2 + b^2 + ab)$

Substitute the values in above expression

$26 = (a – b)(13)$

$a – b = 2$

36) Answer: D

Solution:

As we know the identity, $a^3 + b^3 = (a + b)(a^2 – ab + b^2)$

$P + q = \sqrt{5} + (1/\sqrt{5}) + \sqrt{5} - (1/\sqrt{5}) = 2\sqrt{5}$

Applying $(a + b)(a – b) = a^2 – b^2$

$Pq = (\sqrt{5} + 1/\sqrt{5})(\sqrt{5} – 1/\sqrt{5}) = 5 – 1/5 = 24/5 \rightarrow p^2+q^2 = (p+q)^2-2pq$

Substitute the values of (p + q) and pq in above expression

$p^2 + q^2 = (2\sqrt{5})^2 – 48/5 = 52/5$

Then,

$p^3 + q^3 = (p + q)(p^2 – pq + q^2)$

$p^3 + q^3 = 2\sqrt{5}(52/5 – 24/5) = 2\sqrt{5}(28/5) = 56/\sqrt{5}$

37) Answer: A

Solution:

As, $a^3 + b^3 + c^3 – 3abc = (a + b + c)(a^2 + b^2 + c^2 – ab – bc – ca)$

Put the value of a + b = - c in above expression

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

$a^3 + b^3 + c^3 – 3abc = 0$

38) Answer: C

Solution:

$= (x^2 + 8x + 16)/(x^2 + 6x + 8)$ ---------- (1)

The factors of $x^2 + 8x + 16$ is $(x + 4)(x + 4)$

The factors of $x^2 + 6x + 8$ is $(x + 4)(x + 2)$

Substituting equ.(1) => $(x + 4)(x + 4)/(x + 4)(x + 2) = (x + 4)/(x + 2)$

Thus, $(x + 4)/(x + 2)$ is the required answer

39) Answer: B

Solution:

$= [(a – b)^2 - (a + b)^2]/a^2b – ab^2$

$= (a^2 + b^2 – 2ab – a^2 – b^2 – 2ab]/ab(a – b)$

$=-4ab/ab(a – b)$

$= -4/(a – b)$

40) Answer: D

Solution:

$1/a + 1/b + 1/c = 2$

$(ab + bc + ca)/abc = 2$ ---------- (1)

$abc = (ab + bc + ca)/2$

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

Substitute the values of a + b + c and $a^2+b^2+c^2$ in above expression

Then it becomes,

$100 = 64 + 2(ab + bc + ca)$

$(ab + bc + ca) = 18$

(1) ⇒ $18/abc = 2$

$abc=9$

41) Answer: D

Solution:

Based on algebraic identity, $a^4 – b^4 = (a^2 + b^2)(a^2 – b^2)$

$(a^2 + b^2) = (a^4 – b^4)/ (a^2 – b^2) = 65/5 =13$

42) Answer: B

Solution:

To find the remainder value, put x = 2 in the given expression

$f(x) = x^4 – 2x^3 + 3x^2 – 5x – 8$

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$f(2) = 2^4 - 2(2)^3 + 3(2)^2 - 5(2) - 8$

$= 16 - 16 + 12 - 10 - 8 = -6$

43) Answer: A

Solution:

$x^2 - 3x - 1 = 0$

$\div$ by x => $x - 3 - 1/x = 0$

$X - 1/x = 3$

By using algebraic identity $(a - b)^3 = a^3 - b^3 - 3ab\,(a - b)$

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

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

$x^3 - 1/x^3 = 27 + 9 = 36$

44) Answer: D

Solution:

As, $x^2 - y^2 = (x + y)(x - y)$ -------- (1)

By using identity $(x - y)^2 = (x + y)^2 - 4xy$

$(x - y)^2 = 12^2 - 4(11) = 144 - 44 = 100$

$X - y = 10$

(1)=> $x^2 - y^2 = 12*10 = 120$

45) Answer: C

Solution:

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

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

$x^2 + 1/x^2 = 11$

46) Answer: D

Solution:

$x^2 + 1/x^2 = \sqrt{3}$

Cubing on both sides

$(x^2 + 1/x^2)^3 = (\sqrt{3})^3$

$x^6 + 1/x^6 + 3(x^2)(1/x^2)(x^2+1/x^2) = 3\sqrt{3}$

$x^6 + 1/x^6 = 3\sqrt{3} - 3\sqrt{3} = 0$

$x^{12}+1 = 0$

$x^{12} = -1$

=>$x^{36} + 1/x^{24} = (x^{12})^3 + 1/(x^{12})^2 = (-1)^3+1/(-1)^2 = 0$

47) Answer: B

Solution:

$x^{54} + x^{51} = x^{51}(x^3 + 1)$ -------- (1)

Substitute the value of x^3 in (1)

(1)=> $x^{54} + x^{51} = 0$

48) Answer: A

Solution:

Given

$a/b = 1 - b/a$

The above expression is rewritten as,

$a/b + b/a = 1$

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

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

As per algebraic identity,

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

Substitute the value of $a^2 + b^2$

(2) $\Rightarrow a^3 + b^3 = (a + b)(ab – ab) = 0$

49) Answer: C

Solution:

$X = 11 + 6\sqrt{2}$

$X = (9 + 2 + 6\sqrt{2})$

$X = (3^2 + (\sqrt{2})^2 + 2(3)(\sqrt{2}))$

$x = (3 + \sqrt{2})^2$

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

$1/\sqrt{x} = 1/(3 + \sqrt{2})$

Taking complex conjugate

$1/\sqrt{x} = (3 - \sqrt{2})/((3 + \sqrt{2})(3 - \sqrt{2})) = (3 - \sqrt{2})/(9 – 2) = (3 - \sqrt{2})/7$

$\sqrt{x} + 1/\sqrt{x} = (3 + \sqrt{2}) + ((3 - \sqrt{2})/7)$

$= (21 + 7\sqrt{2} + 3 - \sqrt{2})/7 = (24 + 6\sqrt{2})/7$

50) Answer: B

Solution:

$a(2 - \sqrt{3}) = b(2 + \sqrt{3}) = 1$

This is same as, $a(2 - \sqrt{3}) = 1$ & $b(2 + \sqrt{3}) = 1$

$1/a = (2 - \sqrt{3})$ and $1/b = (2 + \sqrt{3})$

So, $1/a + 1/b = (2 - \sqrt{3}) + (2 + \sqrt{3}) = 4$

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