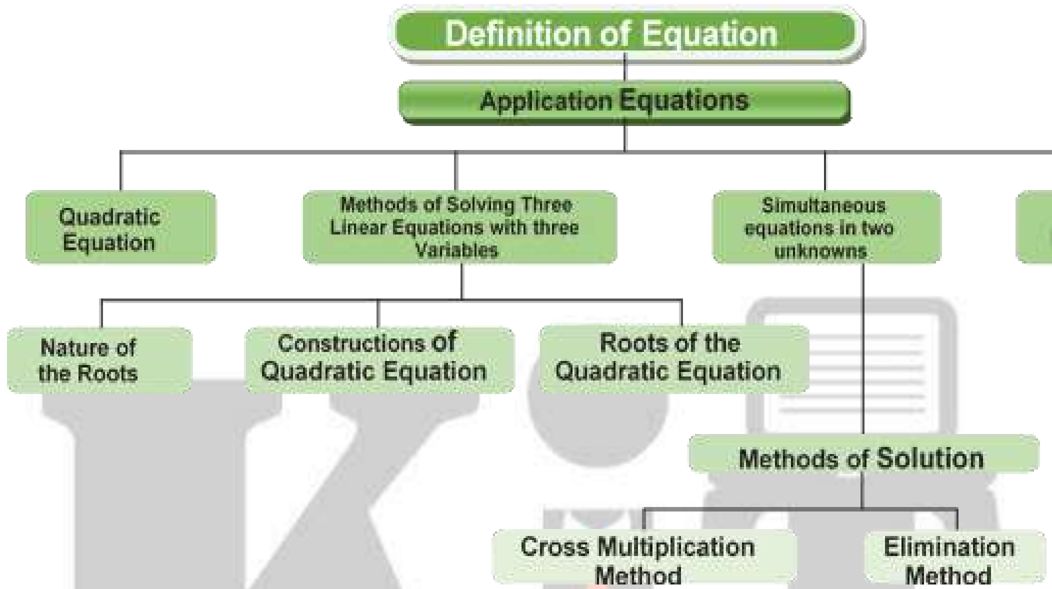
CHAPTER - 2
UNIT I: EQUATIONS



Equation	Equation is defined to be a mathematical statement of equality. If the equality is true for certain value of the variable involved, the equation is often called a conditional equation and equality sign '=' is used; while if the equality is true for all values of the variable involved, the equation is called an identity.
TYPES OF EQUATION	**Simultaneous Linear Equations**: Two or more linear equations involving two or more variables. **Quadratic equation**: An equation of degree 2 (highest Power of the variable is 2) **Cubic Equation**: The equation of degree 3
SIMPLEEQUATION	A simple equation in one unknown x is in the form $ax + b = 0$. Where a, b is known constants and a^1 0

SIMULTANEOUSLINEAREQUATIONS IN TWOUNKNOWNS	The general form of a linear equations in two unknowns' x and y is ax + by + c = 0where a, b are non-zero coefficients and c is a constant. Two such equations $a_1x + b_1y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$ form a pair of simultaneous equations in x and y. A value for each unknown which satisfies simultaneously both the equations will give the roots of the equations.
Elimination Method	In this method two given linear equations are reduced to a linear equation in one unknown by eliminating one of the unknowns and then solving for the other unknown.
Cross Multiplication Method	Let two equations be: $a_1x + b_1y + c_1 =0$ $a_2x + b_2y + c_2 = 0$ $x = \frac{b_1c_2 - b_2c}{a_1b_2 - a_2b_1}$ $x = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b}$
QUADRATIC EQUATION	An equation of the form $ax^2 + bx + c = 0$ where x is a variable and a, b, c are constants with $a^1 \neq 0$ is called a quadratic equation or equation of the second degree. When b=0 the equation is called a pure quadratic equation; when b = 0 the equation is called an affected quadratic. The roots of a quadratic equation: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

CONSTRUCT A QUADRATIC EQUATION	x^2 – (Sum of the roots) x + Product of the roots = 0

Question1

If one root of a equation is 2+$\sqrt{5}$, then the quadratic equation is :

(a) $x^2 + 4x - 1 = 0$ (b) $x^2 - 4x - 1 = 0$

(c) $x^2 + 4x + 1 = 0$ (d) $x^2 + 4x + 1 = 0$

Answer: b

Explanation:

One root of the equation is 2 +$\sqrt{5}$. So, the next root will be 2 - $\sqrt{5}$

$\therefore x = 2 + \sqrt{5}$ and $x = 2 - \sqrt{5}$

$\therefore$ $(x - (2 + \sqrt{5}))\ (x - (2 - \sqrt{5})) = 0$

$\therefore (x^2 + (4 - 5) - 2x - \sqrt{5x} - 2x + \sqrt{5x}) = 0$

$\therefore$ $x^2 - 4x - 1 = 0$ is the required quadratic equation.

Question2

The equation of a line which is perpendicular to 5x – 2y = 7 and passes through the mid – point of line joining (2, 7) and (-4, 1) is:

(a) 2x – 5y -18 = 0 (b) 2x + 5y +18 = 0

(c) 2x + 5y- 18 = 0 (d) None of these

Answer: c

Explanation:

First let us find out the coordinates of the midpoint of the line joining (2, 7) and (-4, 1) using midpoint formula and let this point be P.

P(x, y) = [(x1+x2)/2, (y1+y2)/2]

=> P (x, y) = [(2-4)/2, (7+1)/2]

=> P(x, y) = (-1, 4)

as we have coordinates of P, to form an equation, we need to get the slope of this line.

Since the line passing through P is perpendicular to the line 5x-2y=7, we can find the required slope by using the formula M1×M2 = -1, where M1 is the slope of the given line and M2 is the slope of the line we are supposed to form an equation for.
to find M1 , let us rewrite the given equation in y = M1X + C form.
5x - 2y = 7
=> - 2y = -5x + 7
=> y = -5x/-2 + 7/(-2)
=> y = 5/2 x - 7/2
On comparing this equation with y = M1X + c
We get M1 = 5/2
Now using the equation M1*M2 = -1, we get
5/2 × M2 = -1
Therefore M2 = -2/5
Now as we know M2 and coordinates of P (-1,4) can use slope point form to get the equation
=> (y - y1) = M2(x - x1)
=> y - 4 = -2/5(x - (-1))
=> y - 4 = -2/5(x + 1)
=> 5(y - 4) = -2 (x + 1) [by cross multiplication]
=> 5y - 20 = -2x -2
=> 2x + 5y - 18 = 0 is the answer

Question3

Find the positive value of k for which the equations: $x^2 + kx + 64 = 0$ and $x^2 – 8x + k = 0$ will have real roots:

(a) 12 (b) 16
(c) 18 (d) 22

Answer: b

Explanation:

For real roots, discriminant = $b^2 – 4ac = 0$
For $x^2 + kx + 64 = 0$
= $k^2 – 4 \times 1 \times 64 = 0$
= $k^2 – 256$::: = 0
= k^2 ::: 256
= k :: 16
For x^2-8x+k = 0
= $(-8)^2 – 4 \times 1 \times k = 0$
= 64-4k = 0

= 4k = 64

= k = 16

Hence, k = 16

Question4

A man starts his job with a certain monthly salary and earns a fixed increment every year. If his salary was f 1,500 after 4 years of service and 1,800 after 10 years of service, what was his starting salary and what is the annual increment in rupees?

(a) 1300, 50 (b) 1100,50

(c) 1500, 30 (d) None

Answer: a

Solution:

Let the starting salary be x and the annual increment be y. Then, x+4y = 1500

X + 10y = 1800

Subtracting (1) and (2)

X + 10y = 1800

X + 4y = 1500

6y = 300

Y = 50

Subtracting y = 50 in (1), we get x = 1,300

Therefore, starting salary = x = 1,300

Annual increment = y = 50.

Question5

The value of k for which the points (k, 1), (5,5) and (10,7) may be collinear is:

(a) k = -5 (b) k = 7

(c) k = 9 (d) k = 1

Answer: a

Solution:

The given points are collinear

⇨ $\begin{vmatrix} 5 & 5 & 1 \\ k & 1 & 1 \\ 10 & 7 & 1 \end{vmatrix} = 0$

⇨ $\begin{vmatrix} 5 & 5 & 1 \\ k-5 & -4 & 0 \\ 5 & 2 & 0 \end{vmatrix} = 0$ [$R_2 \to R_2 - R_1$ and $R_3 \to R_3 - R_1$]

⇨ $1.[2(k-5) + 20] = 0$

⇨ $2k + 10 = 0$

⇨ K = -5

Hence, k = -5

Question6

A man went to the Reserve Bank of India with – 1,000. He asked the cashier to give him Rs. 5 and 10 notes only in return. The man got 175 notes in all. Find how many notes of 5 and f 10 did he receive?

(a) (2, 150) (b) (40, 110)

(c) (150,25) (d) None

Answer: c

Solution:

Let the number of notes of, 5 be x and notes of 10 be y.

Then x + y = 175

5x +10 y = 1000

Solving (1) and (2) simultaneously, we get

5x +5y = 875

5x +10y =1000

(–) (–) (–)

- 5y = -125

Y = 25 X = 150

Question7

If (2+y'3) is a root of a quadratic $x^2 + px + q = 0$, then find the value of p and q.

(a) (4,-1) (b) (4,1)

(c) (-4,1) (d) (2,3)

Answer: c

Solution:

If one of the roots of the quadratic is $2+\sqrt{3}$, then other root is $2 - \sqrt{3}$

Sum of roots = $(2 + \sqrt{3}) + (2 - \sqrt{3}) = 4$

Product of roots = $(2 + \sqrt{3})(2 - \sqrt{3}) = 4-3 = 1$

Required equation is:

X^2 – (sum of roots) x + product of roots = 0

Or $x^2 - 4x + 1 = 0$

Now comparing with $x^2 + px + q = 0$

We get, p = -4 and q = 1

Required answer is (-4.1)

Question 8

The length of the rectangle is 5 cm more than its breadth if the perimeter of the rectangle is 40 cm find the area of rectangle

(a) 7.5 cm, 2.5 cm
(b) 10 cm, 5cm
(c) 12.5 cm, 7.5 cm
(d) 15.5 cm, 10.5cm

Answer: c

Solution:

Let the breadth of the rectangle be x cm.
Length = x + 5 cm
Perimeter = 2 (l + b) =
2 (x + 5 + x) = 4x+10 cm
4x+10 = 40
4x = 30
X = 30/4 = 7.5
So breadth = 7.5 cm; length = 12.5 cm
Area = l × b = 12.5 × 7.5 = 93.75
So area = 93.75cm^2

Question9

A straight line of x = 15 is

(a) Parallel to y axis
(b) Parallel to x axis
(c) A diagonal line
(d) Passes through origin

Answer: a

Solution:

A straight line x = 15 is parallel to y axis.
The equation clearly depicts that the line passes through the point P (15, 0).

Question10

The point of intersection of the lines 2x – 5y = 6 and x + y = 3

(a) (0,3)
(b) (3 , 0)
(c) (3,3)
(d) (0, 0)

Answer: b

Solution:

2x – 5y = 6 ----- (1)
X + y = 3 .... (2)
Multiplying eq. (2) by 5 for make be co – efficients of eq. (1) and eq. (2) same, we get:-
5x + 5y =, 15 .... (3)

Adding eq. (1) and eq. (3)

$2x - 5y = 6$

$5x \quad + \ 5y \quad = 15$

$7x = 21$

X = $\frac{21}{7}$

X = 3

Substituting the value of x in eq (1)

2x – 5y = 6

2 × 3- 5y = 6

6 – 5y = 6

5y = 6 – 6

Y = 0

Point of intersection is (3, 0).

Question11

Find the equation of the line passing through the point (1, 1) and parallel to the line 3x +5y+17=0

(a) 3 x +5y +8 = 0 (b) 5 x + 3y +8 =0

(c) 5 x +3y – 8= 0 (d) 3 x +5y – 8=0

Answer: d

Solution:

Let the equation be 3x +5y + k =o. This equation passes through the point 1(1, 1). Therefore, substituting (1, 1). Therefore, substituting (1, 1) in the equation, we get : 3x + 5y + k = 0

3×1+5×1+k=0

3+5+k=0.

K = -8

So, the equation of the straight line is 3x + 5y -8 = 0.

Question12

If one root of the equation x^2-3x+k=0 is 2, then value of k will be:

(a) 1 (b) 0

(c) 2 (d) 10

Answer: c

Solution:

X^2 - 3x + k =0

One root = 2

Putting x = 2, we get

$(2)^2$ - 3(2) + k = 04 – 6 +k = 0

K = 2

Question13

If $|x-2|+|x-3| = 7$ then, 'x' will be equal to

(a) 6 (b) -1

(c) 6 and -1 (d) none

Answer: a

Solution:

If $|x-2| + |x - 3| = 7$

If x – 2 0 and x – 3 0

(x – 2) + (x -3)' = 7

X – 2 + x – 3 = 7

2x = 7 + 2 + 3

2x = 12 => x = 6

Question14

If thrice of A's age 6 years ago be subtracted from twice his present age, the result would be equal to his present ages. Find A's present age.

(a) 9 (b) 10

(c) 11 (d) 12

Answer: a

Solution:

Let x years be A's present age by the question

2x-3(x-6) = x

Or 2x – 3x+ 18 = x

Or –x + 18 = x

Or 2x = 18

Or x = 9

A's present age is 9 years.

Question15

A number consist of two digits the digit in the ten's place is twice the digit in the unit's place. If 18 be subtracted from the number, the digits are reversed. Find the number.

(a) 40 (b) 42

(c) 39 (d) 21

Answer: b

Solution:

Let x be the digit in the unit's place .so the digit in the ten's Place is 2x.
Thus the number becomes 10(2x) + x. By the question
20x + x – 18 = 10x + 2x
Or 21x – 18 = 12x
Or 9x = 18
Or x = 2
So the required number is 10 (2 × 2) + 2 = 42

Question16

For a certain commodity the demand 'd' in kg, for a price 'p' in rupees per kg, is d = 100(10 – p). The supply equation giving the supply s in kg. for a price p in rupees per kg . is s 75(p - 3). The market price is such at which demand equals supply. Find the market price and quantity that will be bought and sold.

(a) 230 (b) 300
(c) 600 (d) 390

Answer: b

Solution:

Given d = 100(10 – p) and s = 75 (p – 3)
Since the market price is such that demand (d) = supply (s)
We have 100(10 –p) and s = 75 (p – 3)
Or 1000 – 100p = 75p – 225
1000 + 225 = 75p + 100p
1225 = 175p
P = 7
So, market price of the commodity is 7 per kg.
The required quantity bought = 100 (10-7) = 300 kg.
And the quantity sold = 75(7-3) = 300 kg.

Question17

The denominator of a fraction exceeds the numerator by 5 and if 3 be added to both the fraction becomes $\frac{3}{4}$, find the fraction.

(a) $\frac{11}{17}$ (b) $\frac{12}{17}$
(c) $\frac{13}{17}$ (d) $\frac{14}{18}$

Answer: b

Solution:

Let x be the numerator and the fraction be $\frac{x}{x+5}$

By the question $\frac{x+3}{x+5+3} = \frac{3}{4}$ or

4x + 12 = 3x +24 or x = 12

The required fraction is $\frac{12}{17}$

Question18

Solve 2x +5 y = 9 and 3x – y = 5.

(a) x = 2 , y = 1 (b) x = 2 , y = 2

(c) x = 1, y = 1 (d) x = 2, y = 0.

Answer: a

Solution:

2x + 5y = 9 …… (i)

3x – y = 5 …… (ii)

By making (i) ×1, 2x+5y = 9

and by making (ii) × 5, 15x – 5y = 25

Adding 17x = 34 or x = 2. Subtracting this values of x in (i) i.e. 5y = 9 - 2x we find:

5y = 9 – 4 = 5

Y = 1

X = 2, y = 1

Question19

The age of a man three times the sum of the ages of his two sons and 5 years hence his age will be double the sum of their ages. Find the present age of the man?

(a) 40 years (b) 41years

(c) 55 years (d) 45 years

Answer: d

Solution:

Let x years be the present age of the man and sum of the present ages of the two sons be y years.

By the condition x = 3y ……. (i)

And x+5 = 2 (y+5+5) ……… (ii)

From (i) & (ii) 3y+5 = 2 (y+10)

Or 3y +5 = 2y + 20

Or 3y – 2y = 20 – 5

Or y = 15

X = 3 × y = 3 × 15 =

45

Hence the present age of the main is 45 years

Question20

Examine the nature of the roots of the following equations $x^2 - 8x + 16 = 0$

(a) roots are real and equal
(b) roots are real, rational and unequal
(c) roots are imaginary and unequal
(d) roots are real irrational and unequal

Answer: a

Solution:

a = 1, b = -8, c = 16

$b^2 - 4ac = (-8)^2 - 4.1.16 = 64 - 64 = 0$

The roots are real and equal.

Question21

Two times a number, decreased by 12 equals three times the number, decreased by 15. Which is the number?

(a) 3
(b) -62
(b) -64
(d) 6

Answer: a

Solution:

Let us denote the number with n. We rewrite the problem as 2n-12=3n-15. We subtract 2n from both sides and get -12=n-15. Then we add 15 to both sides in order to get n=3.

Question22

The roots of a quadratic equation:

(a) $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
(b) $\frac{b\pm\sqrt{b^2-4ac}}{2a}$
(c) Either a or b
(d) None

Answer: a

Solution:

The nature of the roots α and β of equation $ax^2+bc+c = 0$ depends on the quantity or expression $(b^2 - 4ac)$ under the square root sign ……Hence the expression ($b^2 - 4ac$) is Called the discriminant of the quadratic equation $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

Question23

Which of the following is correct?

I. If $b^2-4ac = 0$ the roots are real and equal;

II. If b^2-4ac > 0 then the roots are imaginary;
III. If b^2-4ac <0 then the roots are equal;
IV. If b^2-4ac is a perfect square (0) the roots are real, rational and unequal
V. If b^2-4ac>0 but not a perfect square the roots are real, irrational and unequal.

(a) All the correct
(b) ii & iii
(c) all are correct expect ii & iii
(d) i& iii & iv is correct

Answer: c

Solution:

I. If b^2-4ac = 0 the roots are real and equal
II. If b^2-4ac >0 then the roots are real and unequal (or distinct);
III. If b^2-4ac <0 then the roots are imaginary;
IV. If b^2-4ac is a perfect square (0) the roots are real, rational and unequal (distinct);
v. If b^2-4ac >0 but not a perfect square the roots are real, irrational and unequal

Since b^2-4ac discriminates the roots b^2-4ac is called the discriminant in the equations $ax^2 + bx + c = 0$ as it actually discriminates between the roots.

Question 24

Find the roots of the quadratic equation: $x^2 + 2x – 15 = 0$?

(a) 5, 3
(b) 3,-5
(c) -3 ,5
(d) -3, -5

Answer: b

Solution:

$X^2 + 5x – 3x – 15 = 0$
$X(x +5) – 3(x +5) = 0$
$(x – 3) (x + 5) = 0$
= > x = 3 or x = -5.

Question 25

The sum of the squares of two consecutive positive integers exceeds their product by 91. Find the integers?

(a) 9, 10
(b) 10, 11
(c) 11, 12
(d) 12, 13

Answer: a

Solution:

Let the two consecutive positive integers be x and x + 1

$X^2 + (x + 1)^2 – x (x +1) = 91$

$X^2 + x – 90 = 0$

$(x +10) (x – 9) = 0 => x = -10$ or 9.

As x is positive x = 9

Hence the two consecutive positive integers are 9 and 10.

Question: 26

A number is equal to 4 times this number less 75. What is the number?

(a) 15 (b) 35

(c) 25 (d) 20

Answer: c

Solution:

Let us denote the number with n. The problem can be rewritten as n=4n-75. By subtracting n from both sides, we get 3n-75=0 Now we divide both sides by 3 to get n-25=0, or n=25.

Question: 27

If $\sqrt{3-2x} + \sqrt{7+2x} = 4$, then find the positive value of x?

(a) -3, 1 (b) 3, -1

(c) 3, -2 (d) 3,2

Answer: a

Solution:

Given, $\sqrt{3-2x} + \sqrt{7+2x} = 4$

Or, $\sqrt{3-2x} = 4 - \sqrt{7+2x}$

Squaring on both sides, we get

$(\sqrt{3-2x})^2 = (4 - \sqrt{7+2x})^2$

- ➔ $3 – 2x = 16 + 7 + 2x - 8\sqrt{7+2x}$
- ➔ $4x + 20 = 8\sqrt{7+2x}$
- ➔ $X + 5 = 2\sqrt{7+2x}$

Again squaring on both sides, we get

$(x+5)^2 = (2\sqrt{7+2x})^2$

- ➔ $x^2 + 10x + 25 = 4(7 + 2x)$
- ➔ $x^2 + 10x + 25 = 28 + 8x$
- ➔ $x^2 + 2x – 3 = 0$
- ➔ $x^2 + 3x – x – 3 = 0$
- ➔ $(x + 3) (x – 1) = 0$
- ➔ $X = -3$ or $x = 1$

Possible value of x = 1, -3

Hence, A is the correct option.

Question: 28

I. $a^2 + 11a + 30 = 0$

II. $b^2+6b+5 = 0$ to solve both the equations to find the values of a and b?

(a) If a < b
(b) If $a \leq b$
(c) If the relationship between a and b cannot be established
(d) If a > b

Answer: b

Solution:

(i) $(a+6)(a+5) = 0$

$a = -6, -5$

(ii) $(b+5)(b+1) = 0$

$b = -5, -1 \Rightarrow a \leq b$

Question29

A number is equal to 7 times itself minus 18. Which is the number?

(a) -3
(b) 3
(c) 2
(d) -2

Answer: b

Solution:

The statement is equivalent to the following equation:

X=7x-18x

18 = 7x-x

6x=18

X =3

Question30

If a and b are the roots of the equations $x^2 – 9x + 20 = 0$, find the value of $a^2 + b^2 + ab$

(a) -21
(b) 1
(c) 61
(d) 21

Answer: c.

Solution:

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

i.e., $(a + b)^2 – ab$

from $x^2 – 9x + 20 = 0$, we have

a +b = 9 and ab = 20. Hence the value of required expression $(9)^2 - 20 = 61$.

Question31

If a + b = 29, b +c = 45, a +c = 44. Find a+ b + c?

(a) -21 (b) 1

(c) 59 (d) 118

Answer: c

Solution:

(a + b) + (b +c) + (a + c) = 29 + 45 + 44

a + b + b +c +a +c = 118

2a +2b + 2c = 118

2 (a +b +c) = 118

a + b + c = 59

Question32

A simple equation in one unknown x is in form ax + b = 0. Is true or not?

(a) true (b) false

(c) not sure (d) partial

Answer: a

Solution:

A simple equation in one unknown x is in the form ax + b = 0. Where a, b are known constants and a = 0

Question33

If both the roots of k $(6x^3 + 3) + rx + 2x^2 - 1 = 0$ and $6k (2x^2 + 1) + px + 4x^2 - 2 = 0$ are common, then 2r – p is equal to

(a) -1 (b) 0

(c) 1 (d) 2

Answer: b

Solution:

The two equations can be written as

$x^2 (6k + 2) + rx + (3k - 1) = 0$ ... (1)

and $x^2 (12 k + 4) + px + (6k - 2) = 0$ ... (2)

Divide by 2

$\therefore x^2 (6k + 2) + \frac{P}{2} x + \{3k - 1) = 0$ .... (3)

Comparing (1) and (3), we get $r = \frac{P}{2}$

$\therefore 2r - p = 0.$

Question34

If a root of the equations $x^2 + px + q = 0$ and $x^2 + \alpha x + \beta = 0$ is common then its value will be (where $p \neq \alpha$ and $q \neq \beta$) Condition for common roots is $\frac{12k+4}{6k+2} = \frac{p}{e}$

(a) $\frac{q-\beta}{\alpha-p}$ (b) $\frac{p\beta-\alpha\beta}{q-\beta}$

(c) $\frac{q-\beta}{\alpha-p} - \frac{p\beta-\alpha\beta}{q-\beta}$ (d) None

Answer: b

Solution:

Let the common root be y. Then $y^2 + py + q = 0$ and $y^2 + \alpha y + \beta = 0$ on solving by cross multiplication, we have $\frac{y^2}{p\beta-q\alpha} = \frac{y}{q-\beta} = \frac{1}{\alpha-p}$ \y = $\frac{q-\beta}{\alpha-p}$ and $\frac{y^2}{y} = y = \frac{p\beta-q\alpha}{q-\beta}$

Question35

If the two equations $x^2 - cx + d = 0$ and $x^2 - ax + b = 0$ have one common root and the second has equal roots then 2 (b +d) =

(a) a + c (b) 0

(c) ac (d) -ac

Answer: c

Solution:

Given quadratic equations

$x^2 - cx + d = 0$ ..... (1)

Let α, β be the roots of equation (1)

$x^2 - ax + b = 0$ ..... (2)

Let α, α be the roots of equation (2)

$2\alpha = a$

$\alpha = \frac{a}{2}$

Also, $\alpha^2 = b$

Since, α is a root of (1),

$\alpha^2 - c\alpha + d = 0$

$b + d = \frac{ac}{2}$

$2(b + d) = ac$

Question 36

If x^2 – hx – 21 = 0, x^2 – 3hx + 35 = 0(h >0) has a common root then, the value of h is equal to

(a) 1 (b) 2

(c) 3 (d) 4

Answer: d

Solution:

Subtracting we get 2hx = 56 or hx = 28 putting in any,

$x^2 - 3(28) + 35 = 0$

x^2 - 84 + 35 = 0

x^2 = 49

X = 7

hx = 28

h = 4

Question37

If Every pair of the equations x^2 + px + qr = 0, x^2 + qx + rp = 0, x^2 + rx + pq = 0 have a common root. Then the sum of three common roots is

(a) $\frac{-(p+q+r)}{2}$ (b) $\frac{-(p-q+r)}{2}$

(c) – (p+q+r) (d) –p+q+r

Answer: a

Solution:

Let the roots be (α, β), (β, λ) and (λ, α) respectively

α + β = -p, β + λ = -q, λ + α = -r adding all, we get ∑α = - (p + q + r) / 2 etc.

Question 38

If the equation x^2 + px + q = 0 and x^2 + qx + p = 0, have a common root, then p + q +1

(a) 0 (b) 1

(c) 2 (d) -1

Answer: a

Solution:

Let α is the common root, so α^2 + pα + q = 0 …… (i) and α^2 + q α + p = 0 …. (ii)

From (i) – (ii), ➔(p – q) α + (q – p) = 0 ➔ α = 1 put the value of α in (i), p + q +1 = 0

Question: 39

If $x^2 + \alpha x + 10 = 0$ and $x^2 + bx - 10 = 0$ have a common root, then, $a^2 - b^2$ is equal to

(a) 10 (b) 20

(c) 30 (d) 40

Answer: d

Solution:

Let α be a common root, then $\alpha^2 + a\alpha + 10 = 0$

(i) and $\alpha^2 + b\alpha - 10 = 0$

?... (ii) form (i) – (ii), $(a - b)\alpha + 20 = 0 \Rightarrow \alpha = -\frac{20}{a-b}$ substituting the value of a

(i). We get $\left(-\frac{20}{a-b}\right)^2 + a\left(-\frac{20}{a-b}\right) + 10 = 0 \Rightarrow 400 - 20a(a-b) + 10(a-b)^2 = 0$

$\Rightarrow 40 - 2a^2 + 2ab + a^2 + b^2 - 2ab = 0 \Rightarrow a^2 - b^2 = 40.$

Question: 40

$x^2 - 11x + a$ and $x^2 - 14x + 2a$ will have a common factor, if a = 42

(a) 24 (b) 0, 24

(c) 3 , 24 (d) 0 , 3

Answer: b

Solution:

Expression are $x^2 - 11x + a$ and $x^2 - 14x + 2a$ will have a common factor, then

$\Rightarrow \frac{x^2}{-22a+14a} = \frac{x}{a-2a} = \frac{1}{-14+11} \Rightarrow \frac{x^2}{-8a} = \frac{1}{-3} \Rightarrow x^2 = \frac{8a}{3}$ and $x = \frac{a}{3}$

$\left(\frac{a}{3}\right)^2 = \frac{8a}{3} \Rightarrow \frac{a^2}{9} = \frac{8a}{3}$ pa = 0, 24. Trick we can check by putting the values of afrom the options.

Question: 41

If x be real, then the minimum value of $x^2 - 8x + 16$ is.

(a) -1 (b) 0

(c) 1 (d) 2

Answer: c

Solution:

$[x^2 - 8x + 16]$ since x is real, so $(x - 4)^2$ is always positive and its least value is 0 and so the minimum value of given expression is 1.

Question: 42

Solve the equations 8+2(x-4) = 16

(a) -1 (b) 8
(c) 10 (d) 2

Answer: b

Solution:

First, we removed the parentheses and get 8 + 2(x – 4) = 16, or 8 + 2x – 8 = 16, which gives us 2x=16. We divide by 2 in order to get x = 8.

Question: 43

Solve the equation: x3 +10 = 2xx3+10 = 2x. A) – 1

(a) 6 (b) 8
(c) 10 (d) 2

Answer: a

Solution:

We multiply both sides by 3 to get free of the denominator. This given us x+3-10=3.2x, or x+30=6x by subtracting x from both sides we get 30=5x. Dividing both sides by 5 gives us the answer, x = 6.

Question: 44

2(3x – 7) + 4(3x+2) = 6(5x+9)

(a) 6 (b) -5
(c) 10 (d) 2

Answer: b

Solution:

2(3x-7) +4(3x+2) =6(5x+9)
6x – 14 + 12x +8 = 30x +54
6x + 12x – 30x = 14 – 8 + 54
-12x = 60
X = 60 ÷ (-12)
X = -5

Question45

Find the solution x to the equations x3-x4=2×3-x4=2.

(a) 69 (b) 51
(c) 0 (d) 24

Answer: d

Solution:

We first find the lowest common multiple of 4 and 3. It is 12. Multiplying both sides by 12 gives us x3·12-x4·12=2·12×3·12-x4·12=2.12, or 4x-3x=24, which means that x = 24.

Question46

A number, multiplied by 5, equals itself minus 48. Which is the number

(a) 6 (b) -5
(c) 0 (d) -12

Answer: d

Solution:

5x = x – 48

4x = -48

X = -12

Past Examination Question

MAY - 2018

Question: 1

The value of K for which the points (k, 1)., (5,5) and (10,7) may be collinear is

(a) k =-5 (b) k=7
(c) k=9 (d) k=1

Answer: a

Solution:

Let A(x_1, y_1) = (K, 1),

B (x_2, y_2) = (5, 5), and

< /p > < p > C (x_3, y_3) = (10, 7) are three collinear} points

Area of triangle ABC = 0

$\frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$

$|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$

⇨ |k(5 – 7) + 5(7 – 1) + 10(1 – 5)| = 0

⇨ |-2k + 5 × 6 + 10(-4)| = 0

⇨ |-2k + 30 – 40| = 0

⇨ | - 2k + 10| = 0

⇨ -2k = 10

⇨ $K = \frac{10}{-2}$

⇨ K = -5

Therefore,

Value of k = -5

Question: 2

If α +β =-2 and αβ = -3, then α, β are two roots of the equations, which is:

(a) $x^2 - 2x - 3 = 0$ (b) $x^2 + 2x - 3 = 0$

(c) $x^2 + 2x + 3 = 0$ (d) $x^2 - 2x + 3 = 0$

Answer: b

Solution:

If $\alpha + \beta = -2$ & $\alpha.\beta = -3$

Q.E. is

$X^2 - (\alpha + \beta)\, x + \alpha.\, \beta = 0$

$X^2 - (-2)x + (-3) = 0$

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

Question: 3

If $2^{x+y} = 2^{2x-y} = \sqrt{8}$, then the respective values of x and y are ……….

(a) $1, \frac{1}{2}$ (b) $\frac{1}{2}, 1$

(c) $\frac{1}{2}, \frac{1}{2}$ (d) None

Answer: a

Solution:

$2^{x+y} = 2^{2x-y} = \sqrt{8}$

$2^{x+y} = \sqrt{8}$ and $2^{2x-y} = \sqrt{8}$

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

$2^{x+y} = 2^{3/2}$ $2^{2x-y} = 2^{3/2}$

On Comparing

X+ y=3/2 ------------- (1)

Add: (1) & (2)

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

$2x - y = \frac{3}{2}$ ------------- (2)

3x = 3

X = 1

Putting x = 1 in equation (1)

$X + y = \frac{3}{2}$

$1 + y = \frac{3}{2}$

$Y = \frac{1}{2}$

$X = 1,\ y = \frac{1}{2}$

Question: 4

The triangle formed by lines x+2y=3, 2x-y=1 and y=0 is

(a) Right angled
(b) Equilateral
(c) Isosceles
(d) None

Answer: a

Solution:

Given Equation

X+2y=3 --------------- (1)

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

Y=0 -------------------- (3)

Slope of line (1) is

$m_1 = \frac{\text{Cofficient of x}}{\text{cofficient of y}} = \frac{-1}{2}$

Slope of line (2) is

$m_2 = \frac{\text{cofficient of x}}{\text{cofficient of y}} = \frac{-2}{-1} = 2$

$m_1 \times m_2 = -\frac{1}{2} \times 2$

$m_1 \times m_2 = -1$

Both lines are 1 or to each triangle are also perpendicular.

Question: 5

If $\frac{3}{x+y} + \frac{2}{x-y} = -1$ and $\frac{1}{x+y} - \frac{1}{x-y} = \frac{4}{3}$ then x, y) is:

(a) (2, 1)
(b) (-1, 2)
(c) (1, 2)
(d) None

Answer: c

Solution:

If $\frac{3}{x+y} + \frac{2}{x-y} = -1$ and $\frac{1}{x+y} - \frac{1}{x-y} = \frac{4}{3}$

By hits and trial (1, 2) satisfied both equation so answer is (1, 2)

Question: 6

If the sides of an equilateral triangle are shortened by 3 units, 4 units and 5 units respectively and a right triangle is formed then the sides of equilateral triangle is:

(a) 6 units
(b) 7 units
(c) 8 units
(d) 10units

Answer: c

Solution:

Let the side of equilateral triangle is x

In △ABC

(hypo)^2 = (Base)^2 + (per)^2

$(x - 3)^2 = (x - 4)^2 + (x - 5)^2$

$X^2 + 9 - 6x = x^2 + 16 - 8x + x^2 + 25 - 10x$

$X^2 - 18x + 41 + 6x - 9 = 0$

$X^2 - 12x + 32 = 0$

$X^2 - 8x - 4x + 32 = 0$

X(x-8)-4(x-8) =0

(x - 8) (x - 4)=0

X-8=0 if x-4=0

X=8 and x=4 Impossible side of the triangle is 8

Question: 7

IF α, β are the roots of equation $x^2 + x + 5 = 0$ then $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is equal to

(a) $\frac{16}{5}$ (b) 2

(c) 3 (d) $\frac{14}{5}$

Answer: d

Solution:

Given equation:

$x^2 + x + 5 = 0$

a=1 , b=1 , c=5

if α &β are root of equation

$\alpha + \beta = \frac{-b}{a} = \frac{-1}{1} = -1$

$\alpha\beta = \frac{c}{a} = \frac{5}{1} = 5$

$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\beta} = \frac{(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)}{\alpha\beta}$

$\frac{(-1)^3 - 3 \times 5 \times (-1)}{5}$

$\frac{-1+15}{5} = \frac{14}{5}$

Question: 8

If $|A| = 0$, then A is:

(a) 0 (b) uro matrix

(c) singular matrix (d) non- singular matrix

Answer: C

Explanation:

If |A| =0 then A is singular Matrix.

Question: 9

If A = $\begin{vmatrix} 2i & i \\ i & -i \end{vmatrix}$ then |A|=?

(a) 2
(b) 3
(c) 4
(d) 5

Answer:

Explanation:

A = $\begin{vmatrix} 2i & i \\ i & -i \end{vmatrix}$

$|A| = \begin{vmatrix} 2i & i \\ i & -i \end{vmatrix}$

= 2i. (-i) – i. i

$= -2i^2 - i^2$

= - 2 × (-1) – (-1)

= 2 + 1 = 3

2018 – NOV

Question: 1

Let α and β be the roots of $x^2 + 7x + 12 = 0$. Then the value of $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ will be

(a) $\frac{7}{12} + \frac{12}{7}$
(b) $\frac{49}{144} + \frac{144}{49}$
(c) $-\frac{91}{21}$
(d) None

Answer: c

Solution:

If α & β are the roots of equation

$X^2 + 7x + 12 = 0$

Then $\alpha + \beta = \frac{-b}{a} = \frac{-7}{1} = -7$

$\alpha \times \beta = \frac{c}{a} = \frac{12}{1} = 12$

$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\beta}$

$\frac{(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)}{\alpha\beta} = \frac{(-7)^3 - 3\times12(-7)}{12}$

$\frac{-343+252}{12}$

$= \frac{-91}{12}$

Question: 2

If A = $\begin{bmatrix} -5 & 2 \\ 1 & -3 \end{bmatrix}$ then adj A is

(a) $\begin{bmatrix} -5 & -2 \\ -1 & -3 \end{bmatrix}$ **(b)** $\begin{bmatrix} 3 & -2 \\ -1 & 5 \end{bmatrix}$

(c) $\begin{bmatrix} 5 & 1 \\ 2 & 3 \end{bmatrix}$ **(d)** $\begin{bmatrix} 3 & 2 \\ 1 & 5 \end{bmatrix}$

Answer: (a)

Explanation:

Given A = $\begin{bmatrix} -5 & 1 \\ 2 & -3 \end{bmatrix}$

The co- factor of A

$A_{11} = (-1)^{1+1}(-3) = (-1)^2.(-3) = -3$

$A_{12} = (-1)^{1+2}(1) = (-1)^3.(1) = -1$

$A_{21} = (-1)^{2+1}(2) = (-1)^3.(2) = -2$

$A_{22} = (-1)^{2+2}(-5) = (-1)^4 \times (-5) = -5$

Matrix made by co-factor of A

B = $\begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$= $\begin{bmatrix} -3 & -1 \\ -2 & -5 \end{bmatrix}$

Adj A = B^T

= $\begin{bmatrix} -3 & -1 \\ -2 & -5 \end{bmatrix}^T$

= $\begin{bmatrix} -3 & -2 \\ -1 & -5 \end{bmatrix}$

Question: 3

If A = $\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A = A^T then

(a) x = 0, y = 5 (b) x + y = 5

(c) x = y (d) None of the above

Answer: c

Explanation:

If A = $\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$

Then A^T = $\begin{bmatrix} 5 & y \\ x & 0 \end{bmatrix}$

Given A = A^T

$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix} = \begin{bmatrix} 5 & y \\ x & 0 \end{bmatrix}$

On comparing we get

X = y

Question: 4

Let A^T be the transpose of matrix A having order $m \times n$ then A^T A is a matrix of order.

(a) $m \times m$ (b) $n \times n$
(c) $m \times n$ (d) $n \times m$

Answer: a

Explanation:

The order of matrix A $= 3 \times 2$
The order of A^T $= 2 \times 3$
Matrix A $= m \times n$
A^T $= n \times m$
$A^T A$ $= n \times m$
$m \times n = n \times n$
$A^T \times A$ is a matrix of order $= n \times n$

MAY - 2019

Question: 1

Find the condition that one roots is double the other of $ax^2 + bx + c = 0$

(a) $2b^2 = 3ac$ (b) $b^2 = 3ac$
(c) $2b^2 = 9ac$ (d) $2b^2 > 9ac$

Answer: c

Explanation:

Let m be the one root of the given equation
Then the other root will be 2m.
Then $m + 2m = -b/a$ or, $3m = -b/a$ or, $m = -b/3a$.
Now, $m(2m) = c/a$ or, $(-b/3a)(-2b/3a) = c/a$ or, $2b^2 = 9ac$.

Question: 2

$\begin{pmatrix} x+y & 1 \\ 1 & x-y \end{pmatrix} + \begin{pmatrix} 2 & 3 \\ 2 & -4 \end{pmatrix} = \begin{pmatrix} 12 & 4 \\ 3 & 0 \end{pmatrix}$ **then**

(a) $x = 7\ y = -3$ (b) $x = -7, y = -3$
(c) $x = -7, y = 3$ (d) $x = 7, y = 3$

Answer: d

Explanation:

By option method, Taking D as option

$$\begin{pmatrix} 7+3 & 1 \\ 1 & 7-3 \end{pmatrix} + \begin{pmatrix} 2 & 3 \\ 2 & -4 \end{pmatrix}$$

$$\begin{pmatrix} 10 & 1 \\ 1 & 4 \end{pmatrix} + \begin{pmatrix} 2 & 3 \\ 2 & -4 \end{pmatrix} = \begin{pmatrix} 12 & 4 \\ 3 & 0 \end{pmatrix}$$

Question: 3

A number consists of two digit such that the digit in one`s place in thrice the digit in ten`s place. If 36 be added then the digit are revered find the number

(a) 62 (b) 26

(c) 39 (d) None of these

Answer:(b)

Solution:

Let ten`s place digit = x

One`s place digit = y

Then two digit No = 10x + y

After reversing the digit then new No. = 0y + x

1st condition

Y = 3x ------ (i)

(10x + y) + 36 = (10 y + x)

10x+ y + 36 = 10 y + x

10 x + y – 10 y – x = - 36

9x – 9y = - 36

Putting y = 3x

9x – 9 x 3x – 36 → 18x -36

X = 2

X = 2 in eq (i) we get y = 3 x 2 = 6

Original No = 10x + y = 10x 2 + 6 = 26

Question: 4

$$[1, 2, 3]\begin{bmatrix} log_{10} & 2 \\ log^{10} & 3 \\ log_{10} & 4 \end{bmatrix}$$

Answer:(b)

Solution:

$$[1, 2, 3]\begin{bmatrix} \log_{10} & 2 \\ \log^{10} & 3 \\ \log_{10} & 4 \end{bmatrix}$$

$= 1 \times \log_{10} 2 + 2 \log_{10} 3 + 3 \times \log_{10} 4$

$= \log_{10} 2 + \log_{10} 3^2 + \log_{10} 4^3$

$= \log_{10} 2 + \log_{10} 9 + \log_{10} 64$

$= \log_{10} (2 \times 9 \times 64)$

$= \log_{10} (1152)$

2019 – NOV

Question: 1

Roots of the equation $x^3+9x^2-x-9=0$

(a) 1, 2, 3 (b) 1, -1, -9

(c) 2, 3, -9 (d) 1, 3, 9

Answer:(b)

Solution:

$x^3 + 9x^2 - x - 9 = 0$

By factorization method

$X^2(x+9)-1(x+9) = 0$

$(x^2 - 1)(x+9) = 0$

$(x+1)(x-1)(x-9) = 0$ $[a^2-b^2 = (a+b)(a-b)]$

$(x+1) = 0$ $(x-1) = 0$ $(x+9) = 0$

$X = -1$ $x = 1$ $x = -9$

Question: 2

$$\frac{2x+5}{10} + \frac{3x+10}{15} = 5$$

(a) 10.58 (b) 9.58

(c) 9.5 (d) None

Answer:(b)

Solution:

$\frac{2x+5}{10} + \frac{3x+10}{15} = 5$

$\frac{15(2x+5)+10(3x+10)}{150} = 5$

$30x + 75 + 30x + 100 = 750$

$60x = 575$

$X = \frac{575}{60}$

$X = 9.58$(approx)

Question: 3

Find value of $x^2-10x+1$ if $x = \frac{1}{5-2\sqrt{6}}$

(a) 25 (b) 1

(c) 0 (d) 49

Answer:(c)

Solution:

$x^2 - 10x + 1 = 0$ => give equation

$X = \frac{1}{5-2\sqrt{6}}$

Multiplying by conjugate

$X = \frac{1}{5-2\sqrt{6}} \times \frac{5+2\sqrt{6}}{5+2\sqrt{6}}$

$X = \frac{5+2\sqrt{6}}{(5)-(2\sqrt{6})}$ (a + b) (a – b) = a2 – b2

$X = \frac{5+2\sqrt{6}}{25-24}$

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

$X^2 = (5+2\sqrt{6})^2$ $(a+b)^2 = a^2 + b^2 + 2ab$

$= 25 + 24 + 2 \times 5 \times 2\sqrt{6}$

$X^2 = 49 + 20\sqrt{6}$ --------- (1)

$10x = 10(5 + 2\sqrt{6}) = 50 + 20\sqrt{6}$ -------- (2)

$X^2 - 10x + 1$

$= 49 + 20\sqrt{6} - 50 - 20\sqrt{6} + 1$ {from equation ---- (1) & (2)}

= 0

So, $x^2 - 10x + 1 = 0$

Question: 4

Find the value of k in $3x^2 - 2kx + 5 = 0$

If x =2

(a) 15 (b) -7/14

(c) 17/4 (d) -4/17

Answer:(c)

Solution:

$3x^2 - 2kx + 5 = 0$ { give equation } as it is given x = 2

Then put in place of x = '2'

$3 \times (2)^2 - 2k(2) + 5 = 0$

$3 \times 4 - 2k(2) + 5 = 0$

$12 - 4k + 5 = 0$

$-4k = -12 - 5$

$-4k = -17$

$K = \frac{17}{4}$

DEC - 2020

Question 1

If $2x^2 - (a+6)\,2x + 12a = 0$ then roots are

(a) 4 & a2 (b) 6 & a

(c) 3 & 2a (d) 6 & 3a

Answer: b

Explanation:

Given:

$2x^2 - (a + 6)2x + 12a = 0$

⇨ $2x^2 - 2ax - 12x + 12a = 0$

⇨ $2x(x - a) - 12(x - a) = 0$

⇨ $(2x - 12)(x - a) = 0$

On equation both the factors with '0' we get

⇨ $2x - 12 = 0$ ➔ $x - a = 0$

⇨ $2x = 12$ ➔ $x = a$

⇨ $X = 6$

∴ Two roots are 6 and a

∴ Option B is the correct answer.

Question 2

Solving equation $3g^2 - 14g + 16 = 0$, we get roots as

(a) 0 (b) ± 5

(c) 8 and 2/3 (d) 2 and 8/3

Answer: d

Explanation:

By option d

Putting value 2

$3 \times 2^2 - 14(2) + 16 = 0$

0=0

putting value 8/3

$$3 \times \left(\frac{8}{3}\right)^2 - 14 \times \frac{8}{3} + 16$$

0= 0

Question 3

Solving equations m + m = 6/25 the value of $\sqrt{m}$ = 6/25 the value of 'm' works out to works out to:

(a) 2/25 (b) 1/25

(c) 3/25 (d) 1

Answer: b

Explanation:

Correct option is B $\frac{1}{25}$

$m + \sqrt{m} = \frac{6}{25}$

let $m = t^2$

$\therefore\ t^2 + t = \frac{6}{25}$

$\Rightarrow 25t^2 + 25t - 6 = 0$

$\Rightarrow t = \frac{-25 \pm \sqrt{625+4\times25\times6}}{2\times25}$

$t = \frac{-25 \pm \sqrt{1225}}{50}$

$t = \frac{-25 \pm 35}{50}$

$t = \frac{10}{50}$ and $t = \frac{-60}{50}$

$\therefore$, $t = \frac{1}{5}$ is correct answer

Now, $m = t^2 = \frac{1}{25}$

$\therefore$, Option B is correct.

JULY - 2021

Question 1

If α and β are the roots of the equation $2x^2+5x+k = 0$, and $4(\alpha^2 + \beta^2 + \alpha\beta) = 23$, then which of the following is true?

(a) $k^2+3k-2=0$ (b) $k^2-2k+3=0$

(c) $k^2-2k-3=0$ (d) $k^2-3k+2=0$

Answer: Options (d)

Explanation:

If α and β are the root of equation

$2x^2+5x+k = 0$

Here a = 2, b = 5, c = k

$\alpha + \beta = -\frac{b}{a} = -\frac{5}{2}$

$\alpha.\beta = \frac{c}{a} = \frac{k}{2}$

$4(\alpha^2 + \beta^2 + \alpha\beta) = 23$

$4[(\alpha+\beta)^2 - 2\alpha\beta] = 23$

$4[(\alpha+\beta)^2 - \alpha\beta] = 23$

$4\left[\left(\frac{-5}{2}\right)^2 - \frac{k}{2}\right] = 23$

$4\left[\frac{25}{4} - \frac{k}{2}\right] = 23$

$4\left[\frac{25-2k}{4}\right] = 23$

25 – 2k = 23

2k = 2

K = 1

K = 1 are satisfied the option (d)

$(k^2 - 3k + 2 = 0)$

Question 2

The cost of 2 oranges and 3 apples is ₹ 28. If the cost of an apple is doubled then the cost of 3 oranges and 5 apples is ₹ 75. The original cost of 7 oranges and 4 apples (in ₹) is.

(a) 59 (b) 47

(c) 71 (d) 63

Answer: Options (a)

Explanation:

Let cost 1 orange = Rs x

Cost of 1 mango = Rs. Y

Given

2x + 3y = 28 ……….. (1) × 3

And

3x + 5(2y) = 75

3x + 10y = 75 …………… (2) × 2

6x + 9y = 84

6x + 20y = 150

\- \- \-

\- 11y = - 66

Y = 6

Putting y = 6 in e.g. (1)

2x 3 × 6 = 28

2x + 18 = 28

2x = 28 – 18

2x = 10

The original cost of 7 oranges and 4 apples

= 7x + 4y

= 7 × 5 + 4 × 6

= 35 + 24

= 59

Question 3

The value of 'K' is _______, if 2 is a root of the following cubic equation: x^3 –

(k+1) x+k = 0

(a) 2 (b) 6

(c) 1 (d) 4

Answer: Options (b)

Explanation:

Cubic Equation

$x^3 - (k+1)x + k = 0 \ldots\ldots (1)$

If 2 is a root of cubic equation

So x = 2 in equation (1)

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

8 – 2k – 2 + k = 0

6 – k = 0

K = 6

Question 4

If A = $\begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$ then the value of A^5 is

(a) $\begin{bmatrix} 1 & 0 \\ -1 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 \\ -5 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -5 \\ 0 & 1 \end{bmatrix}$

Answer: Options ()

Explanation:

If A = $\begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$

$A^2 = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix} \; [A^2 = A \, . A]$

$= \left[\begin{bmatrix} 1 \times 1 + 0 \times (-1) & 1 \times 0 + \times 1 \\ (-1) \times 1 + 1\,1\,(-1) & -1 \times 0 + 1 \times 1 \end{bmatrix}\right]$

$= \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$

$A^3 = A^2 . A$

$= \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$

$= \begin{bmatrix} 1+0 & 0+0 \\ -2-1 & 0+1 \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ -3 & 1 \end{bmatrix}$

$A^5 = A^3 \times A^2$

$= \begin{bmatrix} 1 & 0 \\ -3 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$

$$= \begin{bmatrix} 1+0 & 0+0 \\ -3-2 & 0+1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 \\ -5 & 1 \end{bmatrix}$$