UNIT 9 :

Equations

Level 1

1 Solve the equation $\frac{x+1}{2}+3(2-x)=1$.

A -3 B $-\frac{11}{5}$ C $-\frac{11}{7}$ D $\frac{11}{5}$ E 3

2 Solve the equation $(x^2+x+2)(x^2-x-2)=0$.

A $1, -2$

B $2, -1$

C $-1, -2$

D $1, -1, 2, -2$

E All values of x

3 One root of the equation $x^2+kx-6=0$ is 3. $k=$

A -2 B -1 C 0 D 1 E 2

4 If $px^2+(p^2-1)x-p=0$, $x=$

A $\frac{1}{p}$ or p

B $-\frac{1}{p}$ or p

C $\frac{1}{p}$ or $-p$

D $-\frac{1}{p}$ or $-p$

E -1 or p^2

5 If the equation $kx^2-2x+k=0$ has equal roots, $k=$

A -1

B 1

C -1 or 1

D $-\frac{1}{\sqrt{2}}$ or $\frac{1}{\sqrt{2}}$

E Cannot be determined.

6 Which of the following equations has no real roots?

A $x^2+2x+3=0$

B $x^2+5x+3=0$

C $x^2-5x+3=0$

D $2x^2+7x+4=0$

E $2x^2-7x-4=0$

7 A square is removed from a rectangle of length x ($x > 1$) and width 1. If the remaining rectangle is similar to the original one, $x =$

A $\dfrac{1+\sqrt{5}}{2}$

B $\dfrac{1-\sqrt{5}}{2}$

C $\dfrac{1+\sqrt{5}}{4}$

D $\dfrac{1-\sqrt{5}}{4}$

E $\dfrac{5}{4}$

8 If $\begin{cases} x+2y=5 \\ 2x-y=0 \end{cases}$, $x+y=$

A 1 B 2 C 3 D 4 E 5

[9] Solve the system $\begin{cases} y=2x^2-x+3 \\ y=x+7 \end{cases}$

A $x=1,\ y=6$

B $x=-1,\ y=6$

C $x=1,\ y=8$ or $x=-2,\ y=5$

D $x=-1,\ y=6$ or $x=-2,\ y=5$

E $x=-1,\ y=6$ or $x=2,\ y=9$

[10] Solve $\begin{cases} x+y^2=14 \\ 2x-3y=1 \end{cases}$

A $x=5,\ y=3$

B $x=5,\ y=3$ or $x=-\dfrac{9}{2},\ y=-\dfrac{25}{4}$

C $x=3,\ y=5$ or $x=\dfrac{9}{2},\ x=\dfrac{25}{4}$

D $x=3,\ y=5$ or $x=-\dfrac{9}{2},\ y=-\dfrac{25}{4}$

E $x=5,\ y=3$ or $x=-\dfrac{25}{4},\ y=-\dfrac{9}{2}$

[11] The difference between two numbers is 4 and the sum of the squares of the numbers is 136. Find the larger number.

A 10

B 6

C 4

D 10 or 6

E 10 or –6

[12] The sum of the squares of two positive numbers is equal to the squares of the sum of the numbers, which is 16. Find the larger number.

A 1 B 2 C 3 D 4 E 8

Level 2

[13] α and β are the roots of the equation $3x^2 - x + 4 = 0$. $(\alpha^{-1} + \beta^{-1})^{-1} =$

A 4 B 3 C $\frac{4}{3}$ D $\frac{1}{3}$ E $\frac{1}{4}$

[14] α and β are the roots of the equation $x^2 - 2x - 1 = 0$. $\alpha^2 + \alpha\beta + \beta^2 =$

A 5 B 4 C 3 D 2 E 1

[15] The sum of the square of the roots of the equation $x^2 + 3x + k = 0$ is 1. $k =$

A -4 B -3 C 1 D 3 E

[16] If $3x + y = x - 2y = x - y + 2$, find x and y.

A $x = -3,\ y = -2$

B $x = 3,\ y = -2$

C $x = -3,\ y = 2$

D $x = 3,\ y = 2$

E $x = 2,\ y = 3$

[17] Solve the equation $x(x^2 - 2) = (2x + 1)(x^2 - 2)$.

A 0, 2

B $-\frac{1}{2}, 2$

C 0, $\sqrt{2}$

D $\sqrt{2}, -\sqrt{2}$

E $-\frac{1}{2}, \sqrt{2}, -\sqrt{2}$

[18] If the roots of $ax^2 + bx + c = 0$ are equal, the roots of $2ax^2 + bx + 2c = 0$ are

A Real and distinct.

B Real.

C Real and equal.

D Unreal.

E None of the above.

[19] Solve $x^2 + \frac{1}{x^2} = \frac{17}{4}$.

A 1, -1

B 4, -4

C 1, -1, 4, -4

D $\frac{1}{4}, 4$

E $\frac{1}{2}, -\frac{1}{2}, 2, -2$

[20] The lengths of the sides of a right-angled triangle are consecutive even integers. Find its area.

A 6 B 8 C 12 D 24 E 48

[21] If x and y are positive integers and $\begin{cases} xy = 12 \\ x + y = k \end{cases}$, find k.

A 7
B 8
C 7, 8
D 7, 8, 9
E 7, 8, 13

[22] (α_1, β_1) and (α_2, β_2) are the solutions of the system $\begin{cases} x + y = 0 \\ y = x^2 - 4x + 2 \end{cases}$. $\alpha_1 - \beta_2 =$

A 3 B 1 C 0 D -1 E -3

[23] Solve $\begin{cases} x = y^2 - y - 2 \\ x = 3y^2 + 2y - 1 \end{cases}$

A $x = 0,\ y = -1$ or $-\frac{5}{4},\ y = -\frac{1}{2}$

B $x = 0,\ y = -1$ or $x = \frac{5}{4},\ y = \frac{1}{2}$

C $x = -1,\ y = 0$ or $x = -\frac{1}{2},\ y = -\frac{4}{5}$

D $x = -1,\ y = 0$ or $x = \frac{1}{2},\ y = \frac{5}{4}$

E $x = 4,\ y = 1$ or $x = \frac{1}{4},\ y = \frac{1}{2}$

[24] Solve $\begin{cases} 2x^2 + xy + 3y^2 = 6 \\ 4x - 3y = 1 \end{cases}$.

A $x = 1,\ y = 1$ or $x = \frac{17}{26} = \frac{23}{26}$

B $x = 1,\ y = 1$ or $x = -\frac{17}{26},\ y = -\frac{47}{39}$

C $x = -1,\ y = 1$ or $x = -\frac{17}{26},\ y = \frac{23}{26}$

D $x = -1,\ y = -\frac{5}{3}$ or $x = \frac{17}{26},\ y = \frac{23}{26}$

E $x = 1,\ y = 1$

[25] Solve $\begin{cases} x^4 - y^4 = x^2 - y^2 \\ x^2 - 3y^2 = 0 \end{cases}$, where $x > 0$ and $y > 0$.

A $x = \frac{1}{4},\ y = \frac{\sqrt{3}}{4}$

B $x = \frac{1}{2},\ y = -2$

C $x = \frac{\sqrt{3}}{2},\ y = \frac{1}{2}$

D $x = \frac{\sqrt{3}}{4},\ y = \frac{1}{4}$

E $x = \frac{3}{4},\ y = \frac{1}{4}$

[26] If $\begin{cases} x + y = 4 \\ x + z = 5 \\ x^2 + y^2 + z^2 = 26 \end{cases}$, find x.

A $x = 1$ or -5

B $x = 1$ or 5

C $x = -1$ or 1

D $x = -5$ or 5

E $x = 1$ or 4

[27] If $\begin{cases} \alpha + \beta + \alpha\beta = 1 \\ \alpha + \beta - 2\alpha\beta = 7 \end{cases}$, form an equation whose roots are α and β.

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

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

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

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

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

[28] α and β are the roots of the equation $2x^2 - 9x + 20 = 0$. $\log\alpha + \log\beta =$

A 0 B 1 C 2 D $\log\frac{9}{2}$ E $\frac{\log 9}{\log 2}$

[29] Which of the following equations has roots $p + \sqrt{q}$ and $p - \sqrt{q}$?

A $x^2 + 2\sqrt{q}x + p^2 - q = 0$

B $x^2 + 2px + p^2 - q = 0$

C $x^2 - 2px + p^2 - q = 0$

D $x^2 - 2px + p^2 - q^2 = 0$

E $x^2 - 2\sqrt{q}x + p^2 - q^2 = 0$

[30] If α and β are the roots of the equation $2x^2-4x+1=0$, the equation whose roots are α^3 and β^3 is

A $8x^3-3x+1=0$

B $8x^3-3x-1=0$

C $8x^3-5x+1=0$

D $8x^3-40x+1=0$

E $8x^3+40x+1=0$

[31] α and β are the roots of $x^2+\alpha x+\beta=0$. Find α and β $(\alpha\neq\beta)$.

A $\alpha=0,\ \beta=1$

B $\alpha=\frac{1}{2},\ \beta=1$

C $\alpha=1,\ \beta=1$

D $\alpha=1,\ \beta=-2$

E $\alpha=2,\ \beta=0$

[32] If (α_1,β_1) and (α_2,β_2) are the solutions of the system $\begin{cases}2x+y=5\\2x^2+y^2=9\end{cases}$, form a quadratic equation whose roots are β_1 and β_2.

A $3x^2-10x+5=0$

B $3x^2-10x+7=0$

C $3x^2-10x+9=0$

D $3x^2-10x+16=0$

E $3x^2+10x+16=0$