Algebra - 2

Career Launcher

QA - 18

CEX-Q-0219/18

Contents

- Quadratic Equations
- Higher Degree Equations

Number of questions : 32

Quadratic Equations

1. Find the value of b, if $(x + 3)(2x + 5) = 2x^2 + bx + 15$.

2. Ujakar and Keshab attempted to solve a quadratic equation. Ujakar made a mistake in writing down the constant term. He ended up with the roots (4, 3). Keshab made a mistake in writing down the coefficient of x. He got the root as (3, 2). What will be the exact roots of the original quadratic equation? **(CAT 2001)**

(1) (6, 1) (2) (–3, –4)
(3) (4, 3) (4) (–4, –3)

3. If both a and b belong to the set {1, 2, 3, 4}, then the number of equations of the form $ax^2 + bx + 1 = 0$ having real roots is

(1) 10 (2) 7
(3) 6 (4) 12

4. The value of a for which the equation $ax^2 + (a + 1)x + 1 = 0$ has equal root is

(1) 1 (2) 2
(3) –1 (4) None of these

5. If the sum of the roots of the equation $x^2 + ax + 1 = 0$ is equal to the sum of the squares of their reciprocals, then which of the following is a possible value of a?

(1) –1 (2) 2
(3) 1 (4) 4

6. If the sum of the roots of $(a + 1)x^2 + (2a + 3)x + (3a + 4) = 0$ is –1, then the product of the roots is

(1) –2 (2) 2
(3) 1 (4) 6

7. If $\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = = 2\frac{1}{6}$, then the value of x is

(1) $\frac{6}{13}$ or $\frac{4}{13}$ (2) $\frac{3}{2}$ or $\frac{2}{3}$

(3) $\frac{5}{2}$ or $\frac{2}{3}$ (4) $\frac{9}{13}$ or $\frac{4}{13}$

8. Find the value of $\sqrt{6 - \sqrt{6 - \sqrt{6 \ldots \infty}}}$.

(1) $\frac{\sqrt{6}}{2}$ (2) 3

(3) 2 (4) 2.5

9. If, $x = \cfrac{1}{\sqrt{2} + \cfrac{1}{\sqrt{2} - \cfrac{1}{\sqrt{2} + \cfrac{1}{\sqrt{2} - \cfrac{1}{\sqrt{2} + \ldots\ldots\infty}}}}}$

then find the value of x

(1) $\sqrt{2} - 1$

(2) $\sqrt{2} + 1$

(3) 1

(4) Cannot be determined uniquely

Directions for questions 10 and 11: Let $f(x) = ax^2 + bx + c$, where a, b and c are certain constants and $a \neq 0$. It is known that $f(5) = -3f(2)$ and that 3 is a root of $f(x) = 0$. **(CAT 2008)**

10. What is the other root of $f(x) = 0$?

(1) –7 (2) –4
(3) 2 (4) 6
(5) Cannot be determined

11. What is the value of a + b + c?

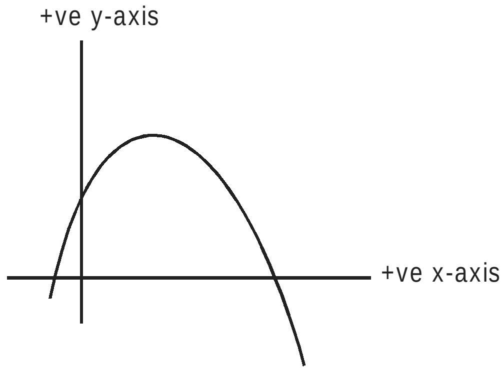
(1) 9 (2) 14
(3) 13 (4) 37
(5) Cannot be determined

12. A quadratic function f(x) attains a maximum of 3 at x = 1. The value of the function at x = 0 is 1. What is the value of f(x) at x = 10? **(CAT 2007)**

(1) – 159 (2) – 110
(3) – 180 (4) – 105
(5) – 119

13. The following curve represents a quadratic function $y = ax^2 + bx + c$. Determine the sign of the coefficient of x^2 and x. Also find the sign of the constrant term.

(Figure drawn on scale)



14. Let f(x) be a quadratic expression with a positive number coefficient of x^2. If the roots of f(x) = 0 lie in the interval (–1, 1) , then which of the following is necessarily true?

(1) f(1) > 0 and f(–1) > 0
(2) f(1) > 0 and f(–1) < 0
(3) f(1) < 0 and f(–1) < 0
(4) f(1) < 0 and f(–1) > 0

15. The equation $ax^2 + bx + c = 0$, where a, b, c are real numbers, has one root greater than 2 and the other root less than zero. Which of the following is necessarily true?

(1) a(a + b + c) > 0
(2) a(a + b + c) < 0
(3) a + b + c > 0
(4) a + b + c < 0

16. If a, b, c are real numbers and $f(x) = ax^2 + bx + c$ such that a + b + c = 3 and f(x + y) = f(x) + f(y) + xy for all real x and y,

then $\sum_{n=1}^{10} f(n)$ is equal to

(1) 165 (2) 190
(3) 255 (4) 330

17. The value of a quadratic function f(x) is negative for all real values of x, except for x = 2. If f(0) = –10, then find the value of f(–2).
(1) – 40 (2) – 80
(3) – 60 (4) Data Inconsistent

18. Find the maximum and the minimum possible values of the function $f(x) = 2x^2 + 7x - 5$, where x is a real number.
(1) $\infty, -22$ (2) $89, -23$
(3) $\infty, \frac{-87}{4}$ (4) $\infty, \frac{-89}{8}$

19. If 0 < p < 1, then roots of the equation $(1 - p)x^2 + 4x + p = 0$ are
(1) Both 0
(2) Real and both negative
(3) Imaginary
(4) Real and both positive

20. Find the sum of all possible real values of p for which the equations $2x^2 - x + 3p = 0$ and $x^2 - x - p = 0$ have a common root.
(1) $-\frac{4}{25}$ (2) $-\frac{21}{4}$
(3) $-\frac{29}{4}$ (4) 0

Higher Degree Equations

21. If all the roots of the equation $x^4 - 4x^3 + ax^2 + bx + 1 = 0$ are positive, then find the values of a and b, where x, a and b are real numbers.
(1) 4 and 6 (2) 6 and –4
(3) $\frac{1}{2}$ and $\frac{7}{2}$ (4) $\frac{7}{2}$ and $-\frac{1}{2}$

22. The cubic equation $x^3 - Ax^2 + Bx - C = 0$ has three positive integral roots two of which are equal. Which of the following statement(s) is necessarily true?
(1) If C is an even number then B must also be an even number.
(2) If B is an even number then A must also be an even number.
(3) If A is an even number then C must also be an even number.
(4) None of these

23. $f(x) = ax^2 + bx + c$ $(a \neq 0)$, is a function whose roots do not lie in the interval (–1, 1). Which of the following holds true?
(1) a + c > 0 (2) $a^2/(b + c) > 1$
(3) $(a + c)^2/b^2 > 1$ (4) $b^2/(a + c) > 1$

24. If one root is the square of the other root in the equation $x^2 + px + q = 0$, mark the correct relationship in the following options.
(1) $p^3 - q(3p + 1) + q^2 = 0$
(2) $p^3 - q(3p - 1) + q^2 = 0$
(3) $p^3 + q(3p - 1) + q^2 = 0$
(4) $p^3 - q(3p - 1) - q^2 = 0$

25. Which of the following statements is correct about the root (s) of the equation $x^2 - |x - 1| + 1 = 0$?
(1) One of the roots lies between –1 and 0 and other lie between 0 and 2.
(2) One of the roots lies between –2 and 0 and other one lies between 0 and 1.
(3) Exactly one root lies between –2 and 1.
(4) Exactly two roots lie between –3 and 3.

26. m is the smallest positive integer such that for any integer $n \geq m$, the quantity $n^3 - 7n^2 + 11n - 5$ is positive. What is the value of m?
(CAT 2001)
(1) 4 (2) 5
(3) 8 (4) None of these

27. The sum of all real values of x satisfying the equation $(x^2 - 5x + 5)^{x^2+4x-60} = 1$ is

(1) –4 (2) 6

(3) 5 (4) 3

28. If $\alpha + \beta = 3$ and $\alpha^3 + \beta^3 = 9$, find the quadratic equation whose roots are α and β

(1) $x(x - 2) = 3$ (2) $x + \frac{2}{x} + 3 = 0$

(3) $x^2 - 2x + 3 = 0$ (4) $x + \frac{2}{x} = 3$

Challenging

29. The number of real roots of the equation $x^6 + 4x^2 - 30 = 0$ is

(1) 0 (2) 2

(3) 4 (4) 6

30. For which value of k does the following pair of equations yield a unique solution of x such that the solution is positive?

$x^2 - y^2 = 0$

$(x - k)^2 + y^2 = 1$

(1) 2 (2) 0

(3) $\sqrt{2}$ (4) $-\sqrt{2}$

31. Given that $f(x) = Ax^2 + Bx + C$ $(A > 0)$. If $f(x) = 0$ has integral roots α and β such that $-4 \le \alpha \le 2$ and $-3 \le \beta \le 3$, then for how many distinct pairs (α, β), $f(0) < 0$?

(1) 18 (2) 12

(3) 21 (4) 49

32. A quadratic polynomial $f(x) = ax^2 + bx + c$ and $x \neq 0$ satisfies the following conditions

1. $f(-5) = 0$
2. $f(14) = f(56)$

Find, f(0)/(f(10).

(1) –5/13 (2) 5/13

(3) 15/17 (4) Cannot be determined

QA - 18 : Algebra - 2
Answers and Explanations

CEX-Q-0219/18

1	–	**2**	1	**3**	2	**4**	1	**5**	3	**6**	2	**7**	4	**8**	3	**9**	1	**10**	2
11	5	**12**	1	**13**	–	**14**	1	**15**	2	**16**	4	**17**	1	**18**	4	**19**	2	**20**	1
21	2	**22**	3	**23**	3	**24**	2	**25**	4	**26**	4	**27**	3	**28**	4	**29**	2	**30**	3
31	1	**32**	2																

1. Multiplying (x + 3) (2x + 5) we get $2x^2 + 5x + 6x + 15$
$= 2x^2 + 11x + 15$.
Comparing coefficients we get b = 11.

2. 1 Quadratic equation having roots (4, 3) is
$(x – 4) (x – 3) = 0$
$\Rightarrow x^2 – 7x + 12 = 0$ ... (i)
Quadratic equation having roots (3, 2) is
$(x – 3) (x – 2) = 0$
$\Rightarrow x^2 – 5x + 6 = 0$ ... (ii)
Picking the coefficient of x from (i) and the constant term from (ii), we get the required equation
$x^2 – 7x + 6 = 0$
$\Rightarrow (x – 6) (x – 1) = 0$
$\therefore x = 1, 6$
Hence, actual roots are (6,1).

Alternative method:
Since constant = [3 × 2] and coefficient of
x = [–4x – 3x] = –7
Since quadratic equation is
x^2 – (Sum of roots)x + Product of roots = 0
or $x^2 – 7x + 6 = 0$
Solving the equation,
(x – 6)(x – 1) = 0 or x = (6, 1).

3. 2 $ax^2 + bx + 1 = 0$
For real roots

$b^2 - 4ac \geq 0$

$\therefore b^2 - 4a(1) \geq 0$

$\therefore b^2 \geq 4a$

For a = 1, 4a = 4, $\therefore$ b = 2, 3, 4
a = 2, 4a = 8, $\therefore$ b = 3, 4
a = 3, 4a = 12, $\therefore$ b = 4
a = 4, 4a = 16, $\therefore$ b = 4
$\therefore$ Number of equations possible = 7.

4. 1 For equation $ax^2 + (a + 1)x + 1 = 0$ to have equal roots, we have
$\Rightarrow (a + 1)^2 – 4a = 0 \Rightarrow a = 1$.

5. 3 Let roots are α, β.

$$(\alpha+\beta) = \frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{(\alpha\beta)^2}$$

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

$$\Rightarrow a^2 + a - 2 = 0$$

$$\Rightarrow a = -2 \text{ or } 1.$$

$\Rightarrow$ (3) is correct.

6. 2 Sum of the roots = $\alpha + \beta = -\frac{2a+3}{a+1} = -1$

$\therefore$ 2a + 3 = a + 1
or a = –2

Product of the roots = $\alpha\beta = \frac{3a+4}{a+1}$

$$= \frac{3\times(-2)+4}{-2+1} = \frac{-2}{-1} = 2$$

7. 4 Put $\sqrt{\frac{x}{1-x}} = y$ and solving $y + \frac{1}{y} = \frac{13}{6}$ we get $y = \frac{3}{2}$ or $\frac{2}{3}$

Subsequently, $\frac{x}{1-x} = \frac{9}{4}$ or $\frac{4}{9}$

or $x = \frac{9}{13}$ or $\frac{4}{13}$

8. 3 $N = \sqrt{(6-N)}$, where $N = \sqrt{6-\sqrt{6-\sqrt{6...\infty}}}$

$\Rightarrow N^2 = 6 - N \Rightarrow N = -3$ or $2 \Rightarrow N = 2$

$N < 0$ cannot be the answer, since $\sqrt{\text{any number}}$ is by definition positive.

Alternative method:

$\sqrt{6} = 2.4$ approximately.
The answer will be slightly less than that.
So, with this logic all the options got eliminated except option (3).

9. 1 $x = \dfrac{1}{\sqrt{2} + \dfrac{1}{\sqrt{2}-x}} = \dfrac{\sqrt{2}-x}{3-\sqrt{2}x}$

$\Rightarrow 3x - \sqrt{2}x^2 = \sqrt{2} - x \Rightarrow \sqrt{2}x^2 - 4x + \sqrt{2} = 0$

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

$\Rightarrow x = \dfrac{2\sqrt{2} \pm \sqrt{8-4}}{2} = \sqrt{2} \pm \dfrac{2}{2} = \sqrt{2} \pm 1$

The value of x is less than 1, hence $\sqrt{2} - 1$ is the valid answer.

10. 2 Given that $f(x) = ax^2 + bx + c$
Also, $f(5) = -3f(2) \Rightarrow f(5) + 3f(2) = 0$
$\Rightarrow (25a + 5b + c) + 3(4a + 2b + c) = 0$
$\Rightarrow 37a + 11b + 4c = 0$ …(i)
Also, as 3 is a root of $f(x) = 0$, thus, $f(3) = 0$.
Therefore, $9a + 3b + c = 0$ …(ii)
Using equation (i) and (ii), we get that $a = b$
Therefore, $c = -12a$
$\Rightarrow f(x) = a(x^2 + x - 12) = a(x + 4)(x - 3)$
Therefore, the other root of $f(x) = 0$ is -4.

11. 5 $f(x) = a(x^2 + x - 12)$
Therefore, the value of a + b + c cannot be uniquely determined.

12. 1 Let $f(x) = ax^2 + bx + c$
At $x = 1$, $f(1) = a + b + c = 3$
At $x = 0$, $f(0) = c = 1$
The maximum of the function f(x) is attained at

$x = -\dfrac{b}{2a} = 1 = \dfrac{a-2}{2a}$

$\Rightarrow a = -2$ and $b = 4$

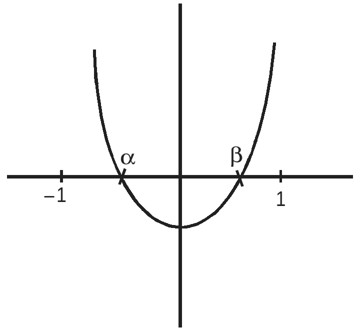
$\therefore f(x) = -2x^2 + 4x + 1$
Therefore, $f(10) = -159$

13. Since figure is drawn to scale, and it shows that co-efficient of x^2 is –ve (curve opens downward), the sum of the roots is positive.

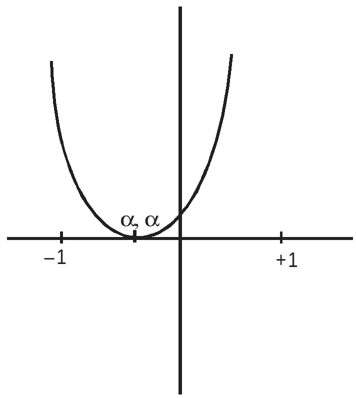
i.e. $(\alpha + \beta) = \dfrac{-b}{a} \rightarrow +ve$ [where α & β are roots]

$\Rightarrow b \rightarrow -ve$ [$\because$ a is –ve]
Now, if x = 0, then y = c.
From graph, at x = 0, y is +ve.
$\Rightarrow$ c is +ve.

14. 1



OR



The graph of the quadratic equation, (in both the above cases) when the coefficient of x^2 is positive, is given above. So, $f(1) > 0$ and $f(-1) > 0$

15. 2 Let $f(x) = ax^2 + bx + c$.
If $a > 0$, then f(x) will be an upward parabola and f(1) must be less than zero, since x = 1 is between the roots of the quadratic.
If $a < 0$, then f(x) will be an downward parabola and f(1) must be greater than zero, since x = 1 is between the roots of the quadratic.
Hence, $a(a + b + c)$ is definitely less than zero.

16. 4 Since $f(x + y) = f(x) + f(y) + xy$
$\therefore a(x + y)^2 + b(x + y) + c = ax^2 + bx + c + ay^2 + by + c + xy$
$\Rightarrow 2axy + c = xy + 2c$
which is possible if $c = 0$ and $a = 1/2$

$\because a + b + c = 3 \Rightarrow b = \dfrac{5}{2}$

So, $f(x) = \frac{x^2}{2} + \frac{5}{2}x$

Now, $\sum_{n=1}^{10} f(n) = \frac{1}{2}\left[\frac{n(n+1)(2n+1)}{6}\right] + \frac{5}{2}\left[\frac{n(n+1)}{2}\right]$

$= \frac{(n+8)n(n+1)}{6}$

Put n = 10

$\sum_{n=1}^{10} f(n) = \frac{18 \times 10 \times 11}{6} = 330.$

17. 1 The maximum value of f(x) must be 0 and this maximum value occurs for x = 2.

Let, $f(x) = -a(x-2)^2$, $f(0) = -10$, $a = \frac{5}{2}$

Hence,

$f(x) = -\frac{5}{2}(x-2)^2 \Rightarrow f(-2) = -\frac{5}{2}(-2-2)^2 = -40.$

18. 4 $f(x) = 2x^2 + 7x - 5$

$\Rightarrow f(x) = 2\left(x^2 + \frac{7}{2}x\right) - 5$

$\Rightarrow f(x) = 2\left(x^2 + 2 \times \frac{7}{4}x + \left(\frac{7}{4}\right)^2\right) - 5 - 2 \times \left(\frac{7}{4}\right)^2$

$\Rightarrow f(x) = 2\left(x + \frac{7}{4}\right)^2 - \frac{89}{8}$

As $\left(x + \frac{7}{4}\right)^2 \geq 0$,

Minimum value of $f(x) = \frac{-89}{8}$

Maximum value of $f(x) = +\infty$

19. 2 The given equation is $(1-p)x^2 + 4x + p = 0$
It's discriminant $16 - 4(1-p)p$ or $16 - 4p(1-p)$ is positive as $0 < p < 1$.

Also, sum of roots $\left(\frac{-4}{(1-p)}\right)$ and product of roots $\left(\frac{p}{1-p}\right)$ are negative and positive in sign respectively.
Therefore, roots of the given equation are real and negative.
Hence, (2) is the correct choice.

20. 1 Let 'a' be the common root for both the equations.

Then a must satisfy both the equations,

i.e., $2a^2 - a + 3p = 0$ and $a^2 - a - p = 0$

$\Rightarrow 2a^2 - a + 3p = a^2 - a - p$

$\Rightarrow a^2 + 4p = 0$

$\Rightarrow p = -a^2/4$

So, $2a^2 - a - \frac{3a^2}{4} = 0$

$\Rightarrow \frac{5a^2}{4} - a = 0 \Rightarrow a = 0, \frac{4}{5}$

$\therefore p = 0, \frac{-4}{25}$

Sum of all possible real values of $p = 0 + \left(-\frac{4}{25}\right) = -\frac{4}{25}$

21. 2 Let us say the roots are $\alpha, \beta, \gamma, \delta$ and given that sum of the roots $\alpha + \beta + \gamma + \delta = 4$ and product of roots $\alpha\beta\gamma\delta = 1$.
Since α, β, γ and δ are positive, the only possible values of α, β, γ and δ is $\alpha = \beta = \gamma = \delta = 1$, because the product of these four roots is maximum.
$\therefore \alpha = \beta = \gamma = \delta = 1.$
$\therefore a = \alpha\beta + \beta\gamma + \gamma\delta + \alpha\delta + \beta\delta + \alpha\gamma = 6,$
$-b = \alpha\beta\gamma + \delta\beta\gamma + \alpha\gamma\delta + \alpha\beta\delta$
$\Rightarrow -b = 4 \Rightarrow b = -4$

22. 3 Let the three roots of this cubic equation be α, α and β. We can write:
$(x-\alpha)(x-\alpha)(x-\beta) = x^3 - A.x^2 + Bx - C = 0$
or $x^3 - (2\alpha + \beta)x^2 + (\alpha^2 + 2\alpha\beta)x - \beta.\alpha^2 = x^3 - Ax^2 + Bx - C$
$\Rightarrow A = 2\alpha + \beta$
$B = \alpha^2 + 2\alpha\beta$
$C = \alpha^2.\beta$
Option (1): If at least one of α and β is an even number, then C will be an even number. If only β is even, then B will be an odd number. Hence, (1) is incorrect.
Option (2): If α is an even number and β is an odd number, then B will be an even number but A will be an odd number. Hence (2) is incorrect.
Option (3): If A is an even number then β must be an even number. Hence, C must be an even number. Hence (3) is correct.

23. 3 Take an example of f(x) where one of the roots is less than –1 and the other is more than 1 and cross check.
If a > 0, f(1)and f(–1) both are negative.
If a < 0, f(1) and f(–1) both are positive.
So, in either case f(1) x f(–1) > 0.
$(a + b + c)(a - b + c) > 0$
$(a + c)^2 - b^2 > 0$
$(a + c)^2 > b^2$
$(a + c)^2/b^2 > 1$

24. 2 Let roots be α and α^2.

Given, $\alpha + \alpha^2 = -p$ and $(\alpha) \times (\alpha^2) = q$

or $\alpha + \alpha^2 = -p$ and $\alpha^3 = q$

$\Rightarrow \left(\alpha+\alpha^2\right)^3 = (-p)^3$

or $(\alpha)^3 + (\alpha^2)^3 + 3(\alpha)^2 \times (\alpha^2) + 3(\alpha)(\alpha^2)^2 = -p^3$

or $p^3 - q(3p-1) + q^2 = 0$

25. 4 **Case I:** For $x < 1$, the equation is:
$x^2 + x = 0$. The roots are $x = 0$ & $x = -1$.
Case II: $x \geq 1$, the equation is:
$x^2 - x + 2 = 0$. There are no real roots.
So the equation has exactly two roots: $x = 0$ & $x = -1$.
Hence, only option (4) is correct.

26. 4 Let $y = n^3 - 7n^2 + 11n - 5$
At $n = 1$, $y = 0$
$\therefore (n-1)(n^2 - 6n + 5)$
$= (n-1)^2 (n-5)$
Now $(n-1)^2$ is always positive.
For $n < 5$, the expression gives a negative quantity.
Therefore, the least value of n will be 6.
Hence, m = 6.

27. 3 $(x^2 - 5x + 5)^{x^2+4x-60} = 1$

Case – I:
When $(x^2 - 5x + 5)^0 = 1$
So, $x^2 + 4x - 60 = 0$
$x = -10, 6$
i.e. two values

Case – II:
When $(1)^{x^2+4x-60} = 1$
So, $x^2 - 5x + 5 = 1$
$x^2 - 5x + 4 = 0$
$x = 1, 4$
i.e. two values

Case – III:
$(-1)^{even} = 1$
So, $x^2 - 5x + 5 = -1$ and $x^2 + 4x - 60$ must be even.
Now, $x^2 - 5x + 5 = -1$
$x^2 - 5x + 6 = 0$
$x = 2$ or 3
For $x = 2$
$x^2 + 4x - 60$ is even
For $x = 3$
$x^2 + 4x - 60$ is odd
we cannot take $x = 3$
i.e. only 1 value
Hence, total 5 values of x are possible.

28. 4 If $\alpha + \beta = 3$ and $\alpha^3 + \beta^3 = 9$
then $\alpha = 1$ and $\beta = 2$, or $\alpha = 2$ and $\beta = 1$ are possible.
$\because$ a quadratic equation with roots α and β is given by
$x^2 - (\alpha + \beta)x + \alpha\beta = 0$
$\Rightarrow x^2 - 3x + 2 = 0$

$\Rightarrow x + \frac{2}{x} = 3.$

29. 2 The given equation is $x^6 + 4x^2 = 30$.
Now, consider the function $f(x) = x^6 + 4x^2$.
This is a symmetric function about the Y axis as well as an increasing function as we go from 0 to $+\infty$ or if we go from 0 to $-\infty$.
Since this is an increasing function, there will only one value of x between 1 and 2 for which the value of the function is 30. Similarly, there will be only value of x between – 1 and – 2 for which the value of the function is 30.
Hence, the number of real roots of the equation $x^6 + 4x^2 = 30$ is 2.

30. 3 $y^2 = x^2$
$2x^2 - 2kx + k^2 - 1 = 0$
$D = 0$
$\Rightarrow 4k^2 = 8k^2 - 8$
$\Rightarrow 4k^2 = 8$
$k^2 = 2 \Rightarrow k = \pm\sqrt{2}$ with $k = +\sqrt{2}$ gives the equation
$= 2x^2 - 2\sqrt{2x} + 1 = 0$; root is: $\frac{-b}{2a} = +\frac{1}{\sqrt{2}}$
but with $k = -\sqrt{2}$, the equation is
$= 2x^2 + 2\sqrt{2}x + 1 = 0$ root is: $-\frac{1}{\sqrt{2}}$
as this root is –ve, will reject $k = -\sqrt{2}$.
Only answer is: $\Rightarrow k = +\sqrt{2}$ only.

31. 1 Since, $A > 0$, $f(0)$ will be less than zero when the product of the roots α and β (i.e. $\alpha\beta$) is negative.
For, $\alpha = -4, -3, -2$ or -1, β can be any of 1, 2 or 3.
Total number of pairs $(\alpha, \beta) = 4 \times 3 = 12$
For $\beta = -3, -2$ or -1, α can be either 1 or 2.
Total number of pairs $(\alpha, \beta) = 3 \times 2 = 6$
Hence, total number of distinct pairs = 12 + 6 = 18.

32. 2 $f(-5) = 0 \Rightarrow 25a - 5b + c = 0$ … (i)
$f(14) = f(56) \Rightarrow (14)^2a + 14b + c = (56)^2a + 56b + c$
$\Rightarrow b = -70a$
Putting this value in equation (i), we get
$c = -375a$.
So, $f(x) = a(x^2 - 70x - 375)$

$$\therefore \frac{f(0)}{f(10)} = \frac{a(-375)}{a(10^2 - 70(10) - 375)} = \frac{5}{13}.$$