

Polynomials



Competency Based Questions



◆ Multiple Choice Questions

1. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
(a) 10 (b) -10 (c) 5 (d) -5

Ans. (b) -10

2. Given that two of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ are 0, the third zero is
(a) $-\frac{b}{a}$ (b) $\frac{b}{a}$ (c) $\frac{c}{a}$ (d) $-\frac{d}{a}$

Ans. (a) $-\frac{b}{a}$

3. If one of the zeroes of the quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is
(a) $\frac{4}{3}$ (b) $-\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

Ans. (a) $\frac{4}{3}$

4. A quadratic polynomial, whose zeroes are -3 & 4, is
(a) $x^2 - x + 12$ (b) $x^2 + x + 12$
(c) $\frac{x^2}{2} - \frac{x}{2} - 6$ (d) $2x^2 + 2x - 24$

Ans. (c) $\frac{x^2}{2} - \frac{x}{2} - 6$

5. If the zeroes of the quadratic polynomial $x^2 + (a+1)x + b$ are 2 and -3, then
(a) $a = -7, b = -1$ (b) $a = 5, b = -1$
(c) $a = 2, b = -6$ (d) $a = 0, b = -6$

Ans. (d) $a = 0, b = -6$

6. The no. of polynomials having zeroes as -2 & 5 is
(a) 1 (b) 2 (c) 3 (d) > 3

Ans. (d) > 3

7. Given that one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, the product of the other two zeroes is

(a) $-\frac{c}{a}$ (b) $\frac{c}{a}$ (c) 0 (d) $-\frac{b}{a}$

Ans. (b) $\frac{c}{a}$

8. If one of the zeroes of the cubic polynomial $x^3 + ax^2 + bx + c$ is -1, then the product of the other two zeroes is

(a) $b - a + 1$ (b) $b - a - 1$
(c) $a - b + 1$ (d) $a - b - 1$

Ans. (a) $b - a + 1$

9. The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are

(a) both +ve (b) both -ve
(c) one +ve & one -ve (d) both equal

Ans. (b) both -ve

10. The zeroes of the quadratic polynomial $x^2 + kx + k, k \neq 0$,

(a) both cannot be +ve
(b) both cannot be -ve
(c) are always unequal
(d) are always equal

Ans. (a) cannot both be positive

11. If the zeroes of the quadratic polynomial $ax^2 + bx + c, c \neq 0$ are equal, then

(a) c and a have opposite signs
(b) c and b have opposite signs
(c) c and a have the same sign
(d) c and b have the same sign

Ans. (c) c and a have the same sign

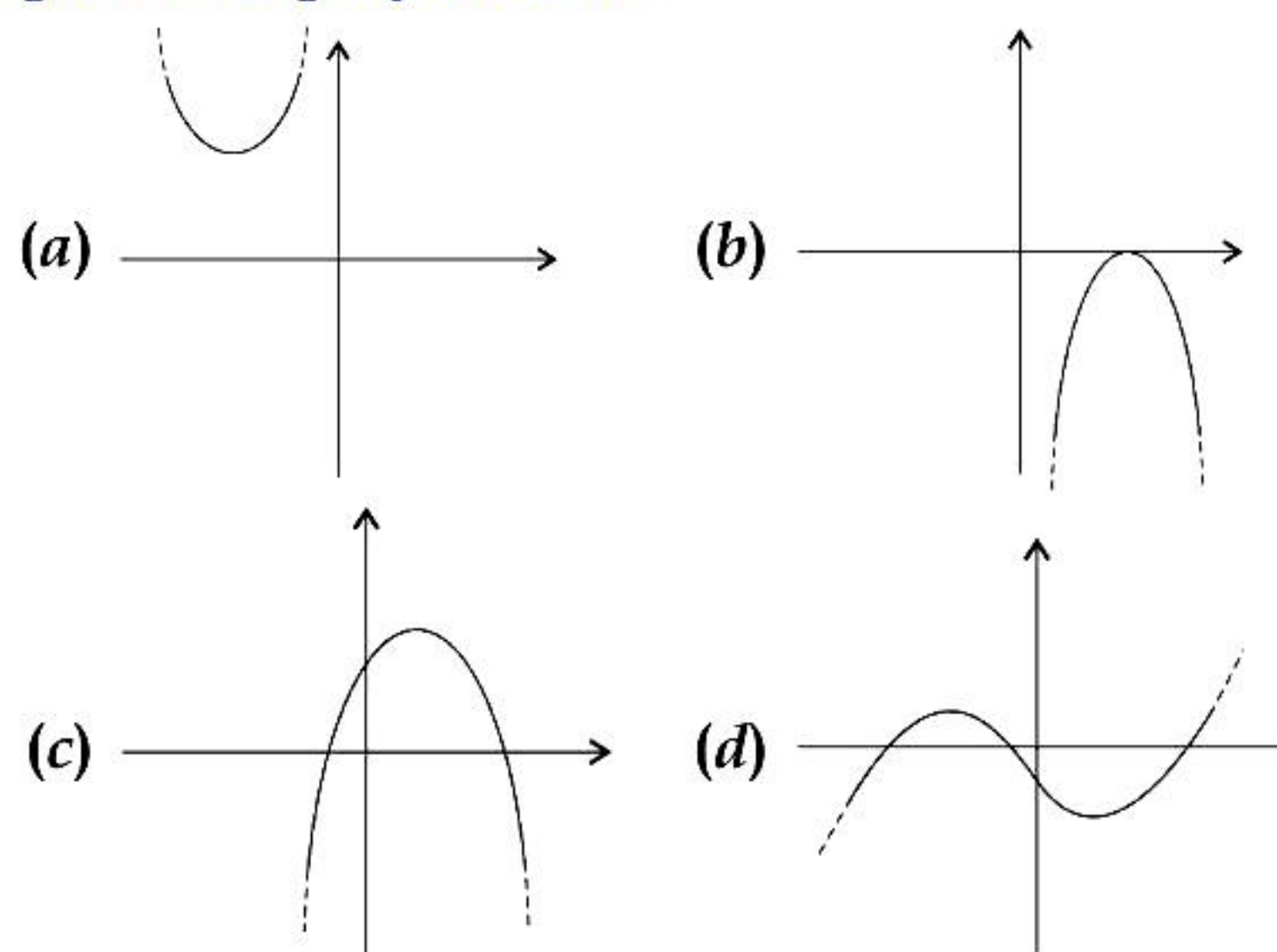
12. If one of the zeroes of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it

(a) has no linear term and the constant term is negative.
(b) has no linear term and the constant term is positive.
(c) can have a linear term but the constant term is negative.

(d) can have a linear term but the constant term is positive.

Ans. (a) has no linear term and the constant term is negative.

13. Which of the following is not the graph of quadratic polynomial?



Ans. (d)

14. The no. of polynomials having zeroes as 4 & 7 is

- (a) 2 (b) 3 (c) 4 (d) > 4

Ans. (d) > 4

15. A Quadratic polynomial with zeroes -4 & -5, is

- (a) $x^2 - 9x + 20$ (b) $x^2 + 9x + 20$
(c) $x^2 - 9x - 20$ (d) $x^2 + 9x - 20$

Ans. (b) $x^2 + 9x + 20$

16. The zeroes of the quadratic polynomial

$$x^2 + 1750x + 175000 \text{ are}$$

- (a) both +ve (b) both -ve
(c) one +ve & one -ve (d) both equal

Ans. (b) both -ve

17. The zeroes of the quadratic polynomial $3x^2 - 48$ are

- (a) both +ve (b) both -ve
(c) one +ve & one -ve (d) both equal

Ans. (c) one +ve & one -ve

18. The zeroes of the quadratic polynomial

$$x^2 - 18x + 81 \text{ are}$$

- (a) both negative
(b) one positive and one negative
(c) both positive and unequal
(d) both equal and positive

Ans. (d) both equal and positive

19. The zeroes of the quadratic polynomial

$$x^2 + px + p, p \neq 0 \text{ are}$$

- (a) both equal (b) both can't be +ve
(c) both unequal (d) both can't be -ve

Ans. (b) both can't be +ve

20. If one of the zeroes of the quadratic polynomial

$$(p - 1)x^2 + px + 1 \text{ is } -3, \text{ then the value of } p \text{ is}$$

- (a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{-3}{4}$ (d) $\frac{-4}{3}$

Ans. (b) $\frac{4}{3}$

21. If the zeroes of the quadratic polynomial

$$Ax^2 + Bx + C, C \neq 0 \text{ are equal, then}$$

- (a) A and B have the same sign
(b) A and C have the same sign
(c) B and C have the same sign
(d) A and C have opposite signs

Ans. (b) A and C have the same sign

22. If $x^3 + 1$ is divided by $x^2 + 5$, then the possible degree of quotient is

- (a) 0 (b) 1 (c) 2 (d) 3

Ans. (b) 1

23. If $x^3 + 11$ is divided by $x^2 - 3$, then the possible degree of remainder is

- (a) 0 (b) 1 (c) 2 (d) < 2

Ans. (d) < 2

24. If $x^4 + 3x^2 + 7$ is divided by $3x + 5$, then the possible degrees of quotient and remainder are:

- (a) 3, 0 (b) 4, 1 (c) 3, 1 (d) 4, 0

Ans. (a) 3, 0

25. If $x^5 + 2x^4 + x + 6$ is divided by $g(x)$, and quotient is $x^2 + 5x + 7$, then the possible degree of $g(x)$ is:

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

Ans. (c) 3

26. If $x^5 + 2x^4 + x + 6$ is divided by $g(x)$ and quotient is $x^2 + 5x + 7$, then the possible degree of remainder is:

- (a) < 1 (b) < 2 (c) < 3 (d) < 4

Ans. (c) < 3

27. What is the number of zeroes that a linear polynomial has/have:

- (a) 0 (b) 1 (c) 2 (d) 3

Ans. (b) 1

28. What is the number(s) of zeroes that a quadratic polynomial has/have:

- (a) 0 (b) 1 (c) 2 (d) 3

Ans. (c) 2

29. What is the number(s) of zeroes that a cubic polynomial has/have:

- (a) 0 (b) 1 (c) 2 (d) 3

Ans. (d) 3

30. If one of the zeroes of the cubic polynomial $x^3 + px^2 + qx + r$ is -1, then the product of the other two zeroes is

- (a) $p + q + 1$ (b) $p - q - 1$
(c) $q - p + 1$ (d) $q - p - 1$

Ans. (c) $q - p + 1$

31. If one zero of the quadratic polynomial

$$x^2 + 3x + b \text{ is } 2, \text{ then the value of } b \text{ is}$$

- (a) 10 (b) -8 (c) 9 (d) -10

Ans. (d) -10

32. If 1 is one of the zeroes of the polynomial $x^2 + x + k$, then the value of k is:

- (a) 2 (b) -2 (c) 4 (d) -4

Ans. (b) -2

◆ Assertion-Reason Questions

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
 (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
 (c) Assertion (A) is true but Reason (R) is false.
 (d) Assertion (A) is false but Reason (R) is true.

1. **Assertion:** $(2 - \sqrt{3})$ is one zero of the quadratic polynomial then other zero will be $(2 + \sqrt{3})$.

Reason: Irrational zeroes (roots) always occurs in pairs.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: As irrational roots/zeroes always occur in pairs therefore, when one zero is $(2 - \sqrt{3})$ then other will be $(2 + \sqrt{3})$.

2. **Assertion:** $x^2 + 4x + 5$ has two zeroes.

Reason: A quadratic polynomial can have at the most two zeroes.

Ans. (d) Assertion (A) is false but Reason (R) is true.

Explanation: Given. $x^2 + 4x + 5$

As we know, $D = b^2 - 4ac$

$$= (4)^2 - 4 \times 1 \times 5 = -4 < 0 \quad \text{(Imaginary roots)}$$

3. **Assertion:** The sum and product of the zeroes of a quadratic polynomial are $-\frac{1}{4}$ and $\frac{1}{4}$ respectively.

Then the quadratic polynomial is $4x^2 + x + 1$.

Reason: The quadratic polynomial whose sum and product of zeroes are gives is $x^2 - (\text{sum of zeroes})x + \text{product of zeroes}$.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: Given. Sum of zeroes = $-\frac{1}{4}$ and

Product of zeroes = $\frac{1}{4}$

Quadratic polynomial be

$$\Rightarrow x^2 - (\text{sum of zeroes})x + (\text{Product of zeroes})$$

$$\Rightarrow x^2 - \left(-\frac{1}{4}\right)x + \frac{1}{4} \Rightarrow x^2 + \frac{1}{4}x + \frac{1}{4} \text{ or } 4x^2 + x + 1$$

4. **Assertion:** If both zeroes of the quadratic polynomial $x^2 - 2kx + 2$ are equal in magnitude but opposite in sign then value of k is $\frac{1}{2}$.

Reason: Sum of zeroes of a quadratic polynomial $ax^2 + bx + c$ is $-\frac{b}{a}$.

Ans. (d) Assertion (A) is false but Reason (R) is true.

Explanation: As the polynomial is $x^2 - 2kx + 2$ and its zeroes are equal but opposite sign.

$$\therefore \text{Sum of Zeroes} = 0 \Rightarrow \frac{-b}{a} = \frac{-(-2k)}{1} = 0$$

$$\Rightarrow 2k = 0 \Rightarrow k = 0$$

5. **Assertion:** Degree of a zero polynomial is not defined.

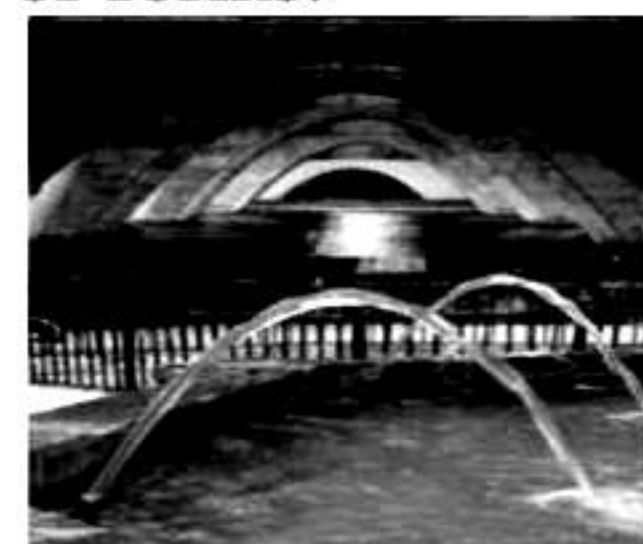
Reason: Degree of a non-zero constant polynomial is '0'.

Ans. (b) Both A and R are true but R is not the correct explanation of A.

Explanation: The polynomial 0 has no terms at all, and is called a zero polynomial. Because the zero polynomial has no non-zero terms, the polynomial has no degree.

◆ Case Based Questions

I. The given pictures are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms.



(i) In the standard form of quadratic polynomial, $ax^2 + bx + c$, a , b and c are

- (a) All are real numbers
 (b) All are rational numbers
 (c) 'a' is a non-zero real number and b & c are any real numbers
 (d) All are integers

Ans. (c) 'a' is a non-zero real number and b and c are any real numbers.

(ii) If the roots of the quadratic polynomial are equal, where the discriminant $D = b^2 - 4ac$, then

- (a) $D > 0$ (b) $D < 0$ (c) $D \geq 0$ (d) $D = 0$

Ans. (d) $D = 0$

(iii) If α and $\frac{1}{\alpha}$ are the zeroes of the quadratic polynomial $2x^2 - x + 8k$, then k is

- (a) 4 (b) $\frac{1}{4}$ (c) $-\frac{1}{4}$ (d) 2

Ans. (b) $\frac{1}{4}$

Explanation: We have, $2x^2 - x + 8k$

Here $a = 2$, $b = -1$ and $c = 8k$

$$\text{Now, Product of zeroes} = \frac{c}{a} \Rightarrow \alpha \frac{1}{\alpha} = \frac{8k}{2} \therefore k = \frac{1}{4}$$

(iv) The graph of $x^2 + 1 = 0$

- (a) Intersects x -axis at two distinct points.
 (b) Touches x -axis at a point.
 (c) Neither touches nor intersects x -axis.
 (d) Either touches or intersects x -axis.

Ans. (c) Neither touches nor intersects x -axis.

Explanation: we have, $x^2 + 1 = 0$

$\Rightarrow x^2 = -1$ (imaginary roots)

(v) If the sum of the roots is $-p$ and product of the roots is $-1/p$, then the quadratic polynomial is

- (a) $k\left(-px^2 + \frac{x}{p} + 1\right)$ (b) $k\left(px^2 - \frac{x}{p} - 1\right)$
 (c) $k\left(x^2 + px - \frac{1}{p}\right)$ (d) $k\left(x^2 - px + \frac{1}{p}\right)$

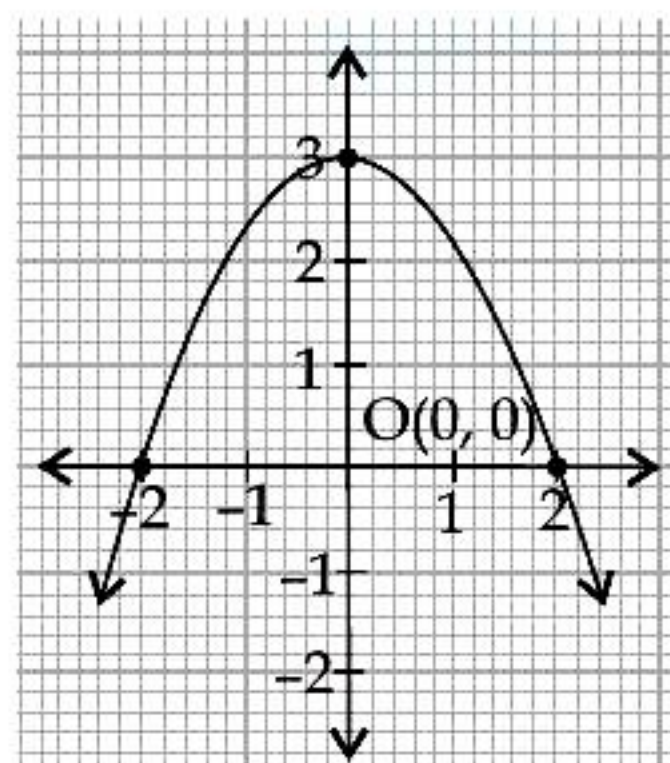
Ans. (c) $k\left(x^2 + px - \frac{1}{p}\right)$

Explanation: $x^2 - Sx + P = 0$

$$\Rightarrow x^2 - (-p)x + \left(-\frac{1}{p}\right) = 0; \quad x^2 + px - \frac{1}{p} = 0$$

$$\therefore k\left(x^2 + px - \frac{1}{p}\right) = 0 \quad \text{where } k \neq 0.$$

II. Seema is studying in class X. She visited the Metro station several times. One day she noticed the roof of the Metro Station. She observed that the roof is formed in a Mathematical shape, that she has learned in Maths class. On reaching home, Seema draws the following graph of the figure:



(i) Seema shows the roof of the metro station in which shape?

- (a) Spiral (b) ellipse (c) linear (d) Parabola

Ans. (d) Parabola

(ii) How many zeroes are possible for this shape?

- (a) 2 (b) 3 (c) 1 (d) 0

Ans. (a) 2

(iii) In the graph, the zeroes of the polynomial are:

- (a) -2, 2 (b) 0, 2 (c) 2, 0 (d) 0, 0

Ans. (a) -2, 2

(iv) What will be the expression of the polynomial?

- (a) $x^2 - 4x + 4$ (b) $-x^2 - 4x + 4$
 (c) $x^2 + 4x + 4$ (d) $x^2 - 4$

Ans. (d) $x^2 - 4$

Explanation: Required Polynomial = $[x^2 - (\alpha + \beta)x + \alpha\beta]$
 $= [x^2 - (-2 + 2)x + (-2)2] = x^2 - 4$

(v) What is the value of the polynomial if $x = 1$?

- (a) -1 (b) 3 (c) -3 (d) 1

Ans. (c) -3

Explanation: $p(1) = (1)^2 - 4 = -3$

III. Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoors on a court made of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial.



(i) The shape of the path traced shown is

- (a) Spiral (b) Ellipse (c) Linear (d) Parabola

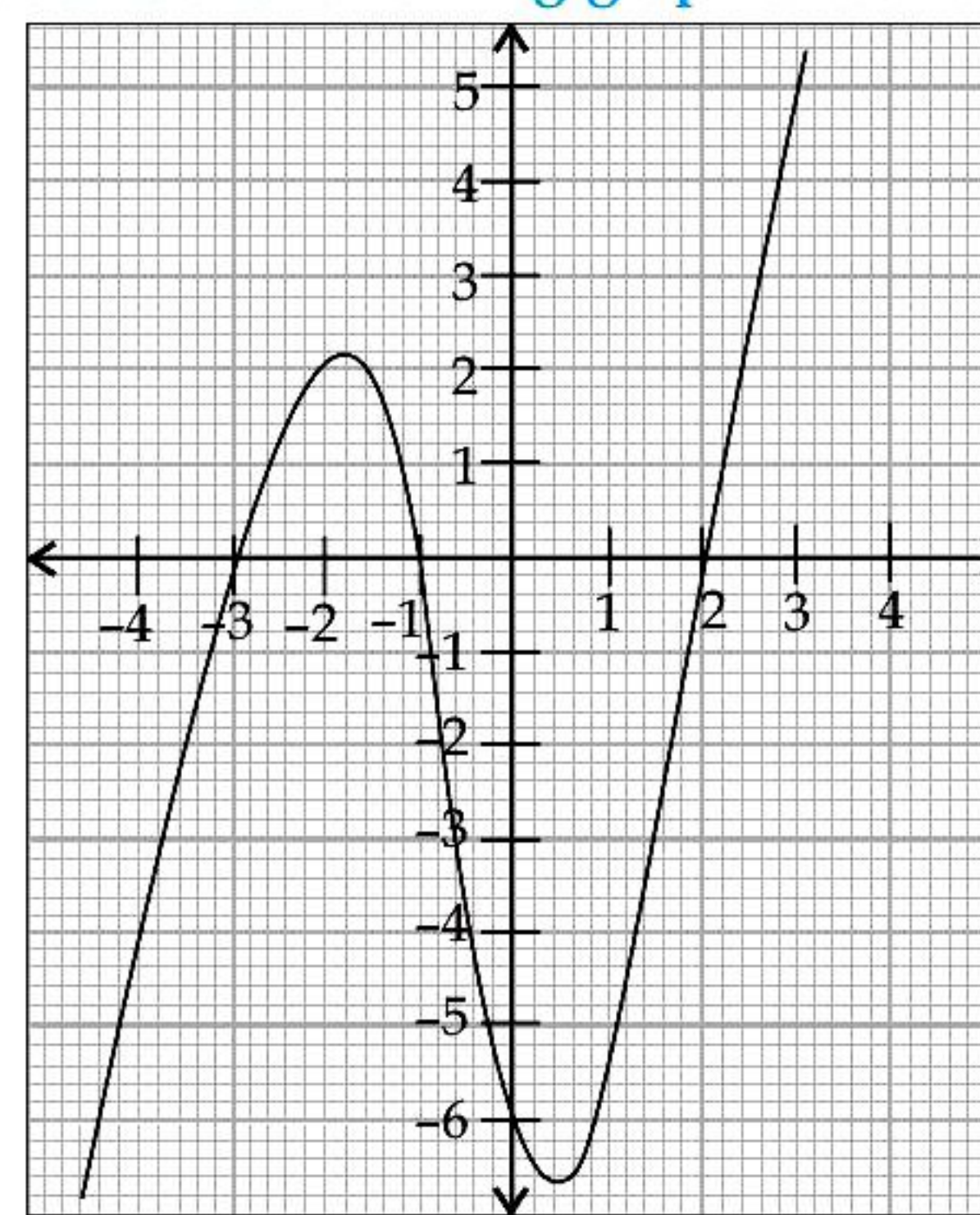
Ans. (d) Parabola

(ii) The graph of parabola opens upwards, if

- (a) $a \geq 0$ (b) $a = 0$ (c) $a < 0$ (d) $a > 0$

Ans. (d) $a > 0$

(iii) Observe the following graph and answer:



In the above graph, how many zeroes are there for the polynomial?

- (a) 0 (b) 1 (c) 2 (d) 3

Ans. (d) 3

(iv) The zeroes in the above shown graph are

- (a) 2, 3, -1 (b) -2, 3, 1
 (c) -3, -1, 2 (d) -2, -3, -1

Ans. (c) -3, -1, 2

(v) What will be the expression of the polynomial?

- (a) $x^3 + 2x^2 - 5x - 6$ (b) $x^3 + 2x^2 - 5x + 6$
 (c) $x^3 + 2x^2 + 5x - 6$ (d) $x^3 + 2x^2 + 5x + 6$

Ans. (a) $x^3 + 2x^2 - 5x - 6$

Explanation: As we know, Required cubic polynomial
 $= x^3 - (\text{sum of zeroes})x^2 + (\text{sum of product of two zeroes})x - (\text{product of these zeroes})$
 $= x^3 - (-3 - 1 + 2)x^2 + [(-3) \times (-1) + (-1) \times 2 + 2 \times (-3)]x - (-3) \times (-1) \times 2$
 $= x^3 + 2x^2 + (3 - 2 - 6)x - 6 = x^3 + 2x^2 - 5x - 6$

IV. An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial.



(i) The graph of $x^2 + 1 = 0$

- (a) Spiral (b) Ellipse
 (c) Linear (d) Parabola

Ans. (d) Parabola

(ii) The graph of parabola opens downwards, if

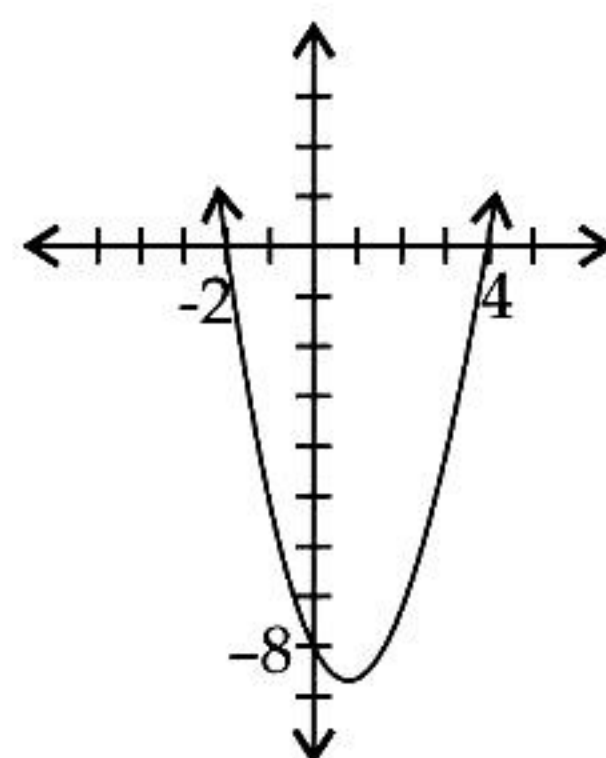
- (a) $a \geq 0$ (b) $a = 0$ (c) $a < 0$ (d) $a > 0$

Ans. (c) $a < 0$

(iii) In the graph, how many zeroes are there for the polynomial?

- (a) 0
 (b) 1
 (c) 2
 (d) 3

Ans. (c) 2



Explanation: As polynomial graph touches the x -axis at two points.

(iv) The two zeroes in the above shown graph are

- (a) 2, 4 (b) -2, 4
 (c) -8, 4 (d) 2, -8

Ans. (b) -2, 4

(v) The zeroes of the quadratic polynomial are $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$.

- (a) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$ (b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

- (c) $\frac{2}{\sqrt{3}}, \frac{-\sqrt{3}}{4}$ (d) $-\frac{2}{\sqrt{3}}, \frac{-\sqrt{3}}{4}$

Ans. (b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

Explanation: $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$

$$4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3} = 0$$

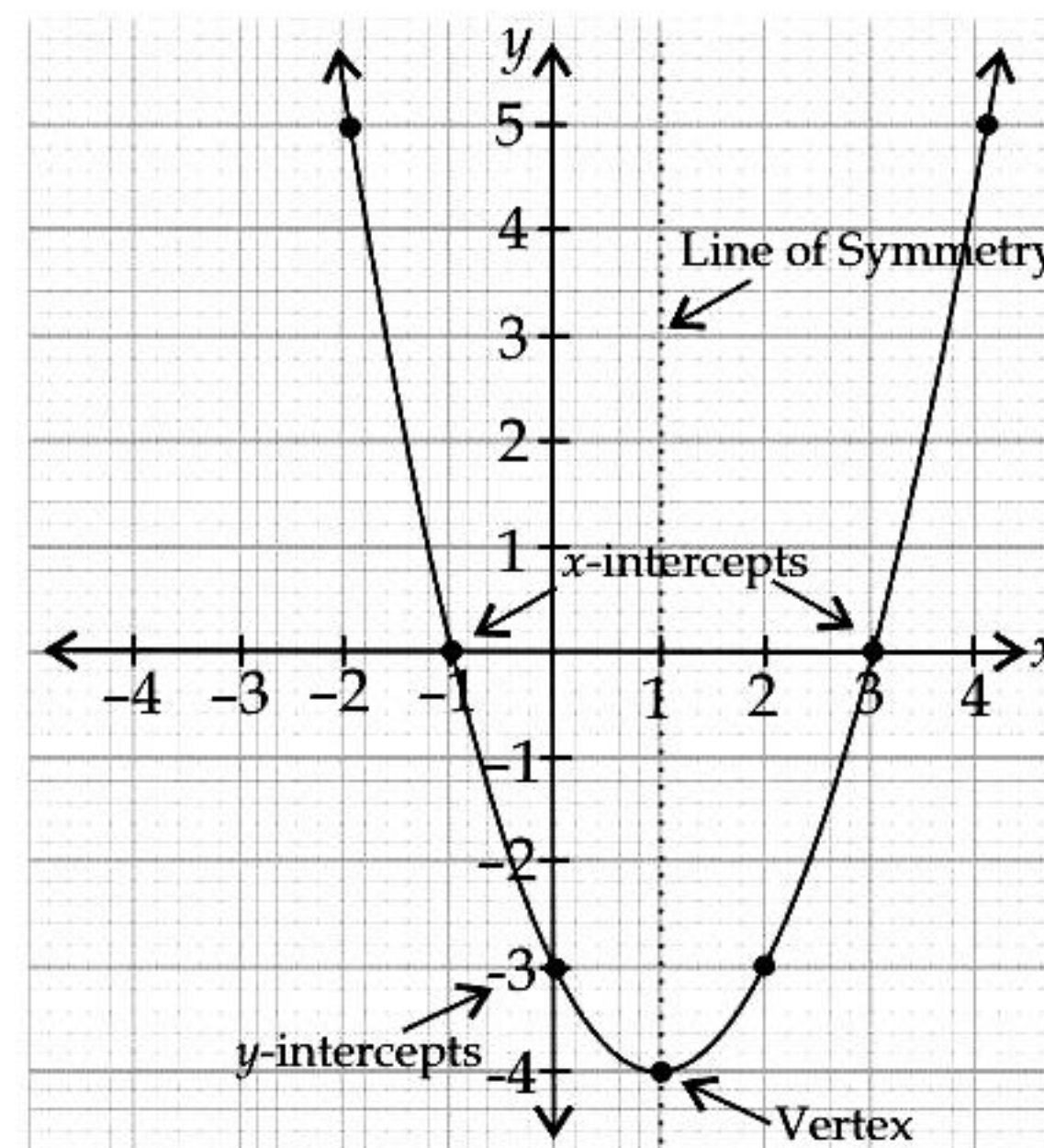
$$4x(\sqrt{3}x + 2) - \sqrt{3}(\sqrt{3}x + 2) = 0$$

$$\sqrt{3}x + 2 = 0 \quad \text{or} \quad 4x - \sqrt{3} = 0$$

$$x = -\frac{2}{\sqrt{3}} \quad \text{or} \quad x = \frac{\sqrt{3}}{4}$$

V. A park has swings made of rubber and iron chain. Sachin who is studying in class X has noticed that this is a Mathematical shape, he has learned in Maths class.

Following questions are raised in his mind. Answer the questions by observing both the pictures:



(i) Name the shape in which the wire is bent.

- (a) Spiral (b) ellipse (c) linear (d) Parabola

Ans. (d) Parabola

(ii) How many zeroes are there for the polynomial (shape of the wire)?

- (a) 2 (b) 3 (c) 1 (d) 0

Ans. (a) 2

(iii) The zeroes of the polynomial are

- (a) -1, 5 (b) -1, 3 (c) 3, 5 (d) -4, 2

Ans. (b) -1, 3

(iv) What will be the expression of the polynomial?

- (a) $x^2 + 2x - 3$ (b) $x^2 - 2x + 3$
 (c) $x^2 - 2x - 3$ (d) $x^2 + 2x + 3$

Ans. (c) $x^2 - 2x - 3$

Explanation: As we know, Required Polynomial

$$= [x^2 - (\alpha + \beta)x + \alpha\beta] = [x^2 - (-1 + 3)x + (-1)3]$$

$$= x^2 - 2x - 3$$

(v) What is the value of the polynomial if $x = 1$?

- (a) -4 (b) 5 (c) -5 (d) 6

Ans. (a) -4

Explanation: $p(1) = (1)^2 - 2(1) - 3 = 1 - 5 = -4$