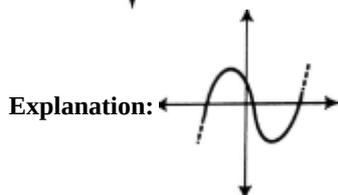
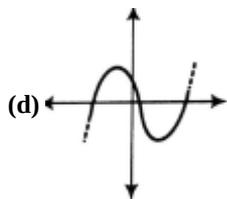


**Solution**  
**POLYNOMIALS WS 1**  
**Class 10 - Mathematics**  
**Section A**

1.



The shape of a quadratic polynomial is either upward or downward U - shaped curve i.e., an upward or downward parabola. Also, the graph of the quadratic equation cuts the X - axis at the most at two points, but in fig it cuts the X - axis at three points.  $\therefore$  fig is not the graph of a quadratic polynomial.

2.

(d) 5

**Explanation:** Graph of  $f(x)$  intersect the x-axis at 5 times.  
hence, No. of zeroes of  $f(x) = 5$

3. (a) Option (iv)

**Explanation:** Clearly,  $\sqrt{2}x^2 - 3\sqrt{3}x + \sqrt{6}$  is a polynomial.

4.

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

**Explanation:**  $4x^2 + 5\sqrt{2}x - 3 = 4x^2 + 6\sqrt{2}x - \sqrt{2}x - 3$   
 $= 2\sqrt{2}x(\sqrt{2}x + 3) - (\sqrt{2}x + 3) = (\sqrt{2}x + 3)(2\sqrt{2}x - 1)$   
 $\therefore x = \frac{-3}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{-3\sqrt{2}}{2}$  or  $x = \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4}$

5. (a)  $5x^3$  is a monomial

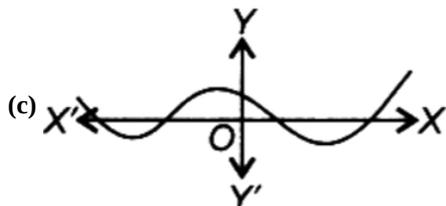
**Explanation:**  $5x^3$  is a monomial as it contains only one term.

6.

(d) 5

**Explanation:** Since, degree of given polynomial is 5,  
so  $ax^5 + bx^3 + cx^2 + dx + e$  has atmost 5 zeroes.

7.



**Explanation:** For more than three distinct real roots the graph must cut x-axis at least four times.

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

**Explanation:** Both A and R are true and R is the correct explanation of A.

9.

(c) A is true but R is false.

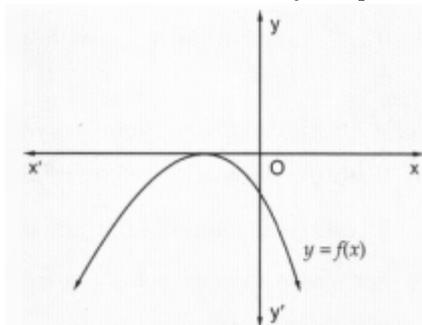
**Explanation:** Degree of zero polynomial is not defined.

10. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.  
**Explanation:** Assertion and reason both are correct statements but reason is not correct explanation for assertion.
11. (d) A is false but R is true.  
**Explanation:**  $x^2 + 7x + 12 = 0$   
 $\Rightarrow x^2 + 4x + 3x + 12 = 0$   
 $\Rightarrow x(x + 4) + 3(x + 4) = 0$   
 $\Rightarrow (x + 4)(x + 3) = 0$   
 $\Rightarrow (x + 4) = 0$  or  $(x + 3) = 0$   
 $\Rightarrow x = -4$  or  $x = -3$   
Therefore,  $x^2 + 7x + 12$  has two real zeroes.
12. (a) 4  
**Explanation:** The number of zeroes is 4 as the graph given in the question intersects the x-axis at 4 points.
13. (a) 3  
**Explanation:** The number of zeroes is 3 as the graph given in the question intersects the x-axis at 3 points.
14. (d) 2  
**Explanation:** The number of zeroes is 2 as the graph intersects the x-axis at two points.
15. (b) 1  
**Explanation:** The number of zeroes is 1 as the graph intersects the x-axis at one point only.
16. (b) 0  
**Explanation:** There is no zero as the graph does not intersect the x-axis at any point.
17. (b) 1  
**Explanation:** The number of zeroes is 1 as the graph given in the question intersects the x-axis at one point only.
18. A real polynomial is an expression of the form  
$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$
where  $n$  is a non-negative integer and  $a_0, a_1, \dots, a_{n-1}, a_n$  are real numbers with  $a_n \neq 0$ .  
The non-negative integer  $n$  is called the degree of  $P(x)$ .  
The numbers  $a_0, a_1, \dots, a_{n-1}, a_n$  are called the coefficients of  $P$ ;  $a_n$  is called the leading coefficient.  
For example,  $p(x) = 3x - 2$  is a polynomial and 3 is a real coefficient.
19. The zero of a polynomial  $f(x)$  is defined as any real number, 'a' such that  $f(a) = 0$
20. The number of zeroes for any graph is the number of values of  $x$  for which  $y$  is equal to zero. And  $y$  is equal to zero at the point where a graph cuts  $x$  axis.  
The number of zeroes is 3 as the graph intersects the  $x$ -axis at 3 points.
21. The number of zeroes for any graph is the number of values of  $x$  for which  $y$  is equal to zero. And  $y$  is equal to zero at the point where a graph intersects  $x$ -axis.  
The number of zeroes is 4 as the graph intersects the  $x$ -axis at 4 points.
22. We observe that the graph  $y = f(x)$  is a parabola opening upwards.  
Therefore,  $f(x)$  is a quadratic polynomial in which coefficient of  $x^2$  is positive.
23. The exponent of the highest degree term in a polynomial is known as its degree.  
In other words, the highest power of  $x$  in a polynomial  $f(x)$  is called the degree of the polynomial  $f(x)$ .  
For Example:  $g(x) = 2x^2 + 3x + 4$  is a polynomial in the variable  $x$  of degree 2.
24. If  $f(x)$  is a polynomial and  $a$  is any real number, then the real number obtained by replacing  $x$  by  $a$  in  $f(x)$ , is called the value of  $f(x)$  at  $x = a$  and is denoted by  $f(a)$ .
25. Here,  $q(x)$  is a quadratic polynomial in which coefficient of  $x^2$  is negative because the graph is a parabola opening downwards.

26. Any quadratic polynomial in variable  $x$  with real coefficients is of the form  $f(x) = ax^2 + bx + c$ , where  $a, b, c$  are real numbers and  $a \neq 0$ .
27. We find that the graph  $y = g(x)$  is a straight line. So,  $g(x)$  is a linear polynomial.
28. The number of zeroes is 3 as the graph given in the question intersects the  $x$ -axis at 3 points.
29. Since the graph of  $p(x)$  intersects the  $x$ -axis at one point only, therefore  $p(x)$  has only one zero
30. The number of zeroes is 2 as the graph intersects the  $x$ -axis at two points.
31. The number of zeroes is 4 as the graph given in the question intersects the  $x$ -axis at 4 points.
32. Number of zeroes = 3
33. Number of Zeroes = 0
34. Since the graph of  $f(x)$  intersects the  $x$ -axis at three points, therefore  $p(x)$  has 3 zeros.

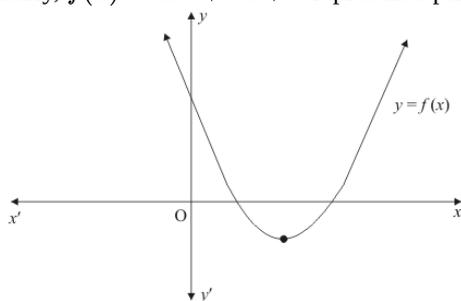
### Section B

35. (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
36. If graph of quadratic polynomial  $f(x) = ax^2 + bx + c$  cuts positive direction of  $y$ -axis, then any point on  $y$ -axis has  $x=0$ .  
So substituting  $x=0$ , in the polynomial expression, we get  
 $y = a \times 0^2 + b \times 0 + c = c$   
So, the graph cuts  $y$ -axis at the point  $y=c$ .  
Since it's given that the graph cuts positive direction of  $y$ -axis, the sign of ' $c$ ' is positive.
37. The graph of the polynomial  $f(x) = ax^2 + bx + c$  touches  $x$ -axis at one point. And we know that if the graph intersects or touches the  $X$ -axis at exactly one point then a quadratic polynomial has two equal zeroes.



Hence the number of real zeros of  $f(x)$  is 2 and  $b^2 - 4ac = 0$ .

38. The number of zeroes is 1 as the graph intersects the  $x$ -axis at one point only.
39. Clearly,  $f(x) = ax^2 + bx + c$  represent a parabola opening upwards. Therefore,  $a > 0$

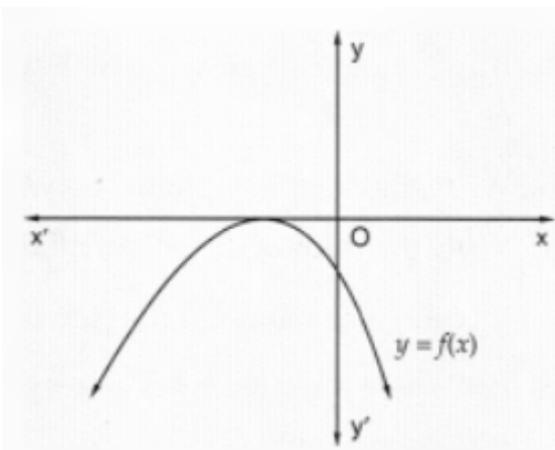


Since the parabola cuts the  $x$ -axis at two points, this means that the polynomial will have two real solutions.

Hence  $b^2 - 4ac > 0$

Hence  $a > 0$  and  $b^2 - 4ac > 0$

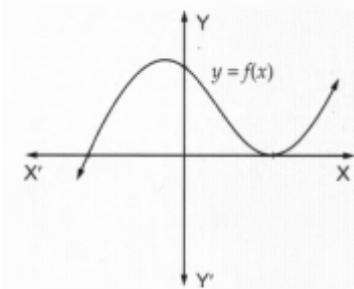
40. Since the graph of quadratic polynomial  $f(x) = ax^2 + bx + c$  cuts negative direction of the  $y$ -axis, we put  $x = 0$  to find the intersection point on  $y$ -axis.  
 $y = 0 + 0 + c = c$   
So, the point is  $(0, c)$ .  
Now it is given that the quadratic polynomial cuts negative direction of  $y$ -axis.  
So  $c < 0$
41. There is no zero as the graph does not intersect the  $x$ -axis at any point.
42. The parabola  $y = ax^2 + bx + c$  cuts  $y$ -axis at one point which lies on  $Oy$ .



Putting  $x = 0$  in  $y = ax^2 + bx + c$ , we get  $y = c$ . So the coordinates of the point are  $(0, c)$ .

Clearly, intersecting point lies on  $Oy'$ . Therefore  $c < 0$  i.e.,  $c$  is negative.

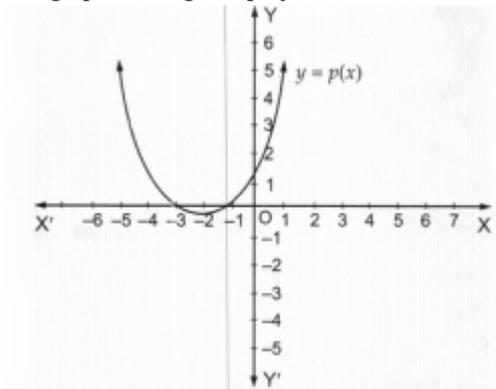
43. A real number  $\alpha$  is a zero of polynomial  $f(x)$ , if  $f(\alpha) = 0$



In the above figure the curve intersects  $x$ -axis at one point and touches at one point.

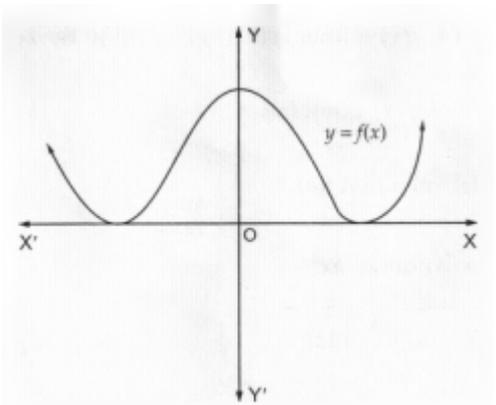
Hence the number of real zeroes is 2.

44. The graph of the given polynomial meets the  $x$ -axis at -1 and -3



$\therefore$  Zeros of the polynomial are -1 and -3

45. The graph of a polynomial  $f(x)$  touches  $x$ -axis at two points.



We know that if a curve touches the  $x$ -axis at two points then it has two distinct roots each repeated two times.

Therefore, the number of zeros of this polynomial is 4

46. The parabola  $y = ax^2 + bx + c$  cuts  $y$ -axis.

Putting  $x = 0$  in  $y = ax^2 + bx + c \Rightarrow y = c$

Clearly,  $P$  lies on  $Oy$ . Therefore  $c > 0$

Hence, the sign of c is positive.

### Section C

47. Point of intersection of graph of polynomial, gives the zeroes of the polynomial.

$\therefore$  zeroes = -4 and 7

48. Since, zero's are  $\alpha = -4$ ,  $\beta = 7$

$$\alpha + \beta = -4 + 7 = 3$$

$$\alpha\beta = -4 \times 7 = -28$$

$$P(x) = x^2 - (\text{Sum of zeroes})x + \text{product of zeroes}$$

$$P(x) = x^2 - 3x + (-28)$$

$$P(x) = x^2 - 3x - 28$$

49. Product of zeroes =  $-4 \times 7$

$$= -28$$

50. a is a non-zero real number, b and c are any real numbers c.

51. Parabola

52. As the curve cuts x-axis two times

$\therefore$  No of zero's = 2

53.  $\therefore$  The parabola cuts x-axis at  $x = -2$  and  $x = 4$

$\therefore$  The zero's are = -2, 4

54. 2

55. Parabola

56.  $a > 0$

57.  $\therefore$  The graph cut the x-axis thrice

$\therefore$  No of zeroes = 3

58.  $a < 0$

59. Two

60. 7 and -7

61.  $-(a + 1) = 2 + (-3) \Rightarrow a = 0$

$$b = 2 \times (-3) \Rightarrow b = -6$$

62. Let  $\alpha$  and  $\beta$  be the zeroes of given polynomial

Here,  $\alpha + \beta = -p$  and  $\alpha\beta = 45$

$$(\alpha - \beta)^2 = 144$$

$$\Rightarrow (\alpha + \beta)^2 - 4\alpha\beta = 144$$

$$\Rightarrow (-p)^2 - 4 \times 45 = 144$$

$$\Rightarrow p = \pm 18$$

### Section D

63. Fill in the blanks:

(i) 1. 4

(ii) 1. Biquadratic

(iii) 1. Straight line

(iv) 1. Degree

(v) 1. 3

(vi) 1. 3

### Section E

64. State True or False:

(i) (a) True

**Explanation:** True

(ii) (a) True

**Explanation:** True

(iii) (a) True

**Explanation:** True

(iv) (a) True

**Explanation:** True.

Let  $\alpha$ ,  $\beta$  and  $\gamma$  be the zeroes of the polynomial  $p(x) = ax^3 + bx^2 + cx + d$ , where  $\alpha, \beta, \gamma > 0$

Product of all the zeroes = - (constant term) / coefficient of  $x^3$

$$\alpha\beta\gamma = -d/a > 0 (\because \alpha, \beta, \gamma > 0 \Rightarrow \alpha\beta\gamma > 0)$$

$$\Rightarrow d/a < 0$$

$\Rightarrow$  d and a have different signs.

Sum of the products of two zeroes at a time = coefficient of  $x$  / coefficient of  $x^3$

$$\alpha\beta + \beta\gamma + \alpha\gamma = da > 0 (\because \alpha, \beta, \gamma > 0 \Rightarrow \alpha\beta, \beta\gamma, \alpha\gamma > 0 \Rightarrow \alpha\beta + \beta\gamma + \alpha\gamma > 0)$$

which means c and a have the same signs.

Sum of the zeroes = - (coefficient of  $x^2$ ) / coefficient of  $x^3$

$$\alpha + \beta + \gamma = -b/a > 0 \dots (\because \alpha, \beta, \gamma > 0 \Rightarrow \alpha + \beta + \gamma > 0)$$

$$\Rightarrow b/a < 0$$

$\Rightarrow$  b and a have different signs.

Case1: when  $a > 0 \Rightarrow c > 0$ ,  $b < 0$  and  $d < 0$

Case2: when  $a < 0 \Rightarrow c < 0$ ,  $b > 0$  and  $d > 0$

$\therefore$  in both cases two of the coefficients are non - negative.

(v) (a) True

**Explanation:** True, If the graph of a polynomial intersects the  $x$  - axis at exactly two points, it need not be a quadratic polynomial.

The polynomial with degree greater than 2 can also intersect the  $x$  - axis at two points. Hence, it need not be a quadratic polynomial.

(vi) (a) True

**Explanation:** True,

If the graph of a polynomial intersects the  $x$ -axis at only one point it need not be a quadratic polynomial.

The quadratic polynomial cuts the  $x$ -axis at most at two points i.e. it can either touch  $x$ -axis at two points or one point or doesn't touch the axis at all.

Hence the polynomial intersecting the  $x$ -axis at only one point need not be a quadratic polynomial.

(vii) (a) True

**Explanation:** True