Polynomials

Question 1.
If a polynomial p(y) is divided by y + 2, then which of the following can be the remainder:
(a)y + 1
(b)2y + 3
(c) 5
(d)y – 1

Answer: (c) 5
When p(y) is divided by y + 2, then the degree of remainder < deg of (y + 2)

Question 2.
If a polynomial p(x) is divided by b – ax; the remainder is the value of p(x) at x =
(a) a
(b) $\frac{b}{a}$
(c) $\frac{-b}{a}$
(d) $\frac{a}{b}$

Answer: (b) $\frac{b}{a}$
b – ax = 0
x = $\frac{b}{a}$

Question 3.
If the polynomials $ax^3 + 4x^2 + 3x - 4$ and $x^3 - 4x + a$, leave the same remainder when divided by (x – 3), then value of a is :
(a) 2b
(b) – 1
(c) 1
(d) – 2b

Answer: (b) – 1
$p(x) = ax^3 + 4x^2 + 3x - 4$
$q(x) = x^3 - 4x + a$

p(3) = q(3)
a = – 1

Question 4.
If $p(x) = 2x^4 – ax^3 + 4x^2 + 2x + 1$ is a. multiple of 1 – 2x, then find the value of a :
(a) 25
(b) $\frac{1}{2}$
(c) $\frac{-1}{2}$
(d) 8

Answer: (a) 25
p(x) is a multiple of 1 – 2x.
1 – 2x is a factor of p(x)

Question 5.
If -2 is a zero of $p(x) = (ax^3 + bx^2 + x – 6)$ and p(x) leaves a remainder 4 when divided by (x – 2), then the values of a and b are (respectively):
(a)a = 2,b = 2
(b) a = 0,b = – 2
(c) a = 0, b = 2
(d) a = 0, b = 0

Answer: (c) a = 0, b = 2
If – 2 is a zero =>
p(- 2) = 0
=> – 2a + b = 2
Also, p(2) = 4
2a + b = 2=>a = 0and b = 2

Question 6.
If $x^{101} + 1001$ is divided by x + 1, then remainder is:
(a) 0
(b) 1
(c) 1490
(d) 1000

Answer: (d) 1000
p(x) is divided by x + 1
$p(- 1) = (-1^{101}) + 1001 = 1000$

Question 7.
If one zero of a polynomial $p(x) = ax^2 + bx + c (a \neq 0)$ is zero, then, which of the following is correct:
(a) $b = 0$
(b) $c = 0$
(c) other zero is also zero
(d) Nothing can be said about p(x).

Answer: (b) $c = 0$
let ,$\alpha = 0$
Product of the roots = $\alpha s = 0$
$= \frac{c}{a} = 0$

Question 8.
If α, s are the zeroes of $x^2 - lx + m$, then
$\frac{\alpha}{s} + \frac{s}{\alpha}$
(a) $\frac{l^2 - 2m}{m}$
(b) $\frac{l^2 + 2m}{m}$
(c) $\frac{l - 2m}{m}$
(d) $l^2 - 2m$

Answer: (a) $\frac{l^2 - 2m}{m}$
$\alpha + s = l$
$\alpha s = m$

$$\Rightarrow \alpha^2 + s^2 = (\alpha + s)^2 - 2\alpha s = l^2 - 2m$$

$$\Rightarrow \frac{\alpha}{s} + \frac{s}{\alpha} = \frac{\alpha^2 + s^2}{\alpha s} = \frac{l^2 - 2m}{m}$$

Question 9.
sum of the squares of the zeroes of the polynomial $p(x) = x^2 + 7x - k$ is 25, find k.
(a) 12
(b) 49
(c) – 24
(d) – 12

Answer: (d) – 12
$p(x) = x^2 + 7x - k$
let α,s be the zeroes

$\alpha + s = -7$
$\alpha s = -k$
$\alpha^2 + s^2 = 25$
$(\alpha^2 + s) - 2\alpha s = 25$
$49 + 2k = 25$
$k = -12$

Question 10.
If one zero of $3x^2 - 8x + 2k + 1$ is seven times the other, find k.
(a) $\frac{2}{3}$
(b) $\frac{1}{3}$
(c) $\frac{4}{3}$
(d) $\frac{5}{3}$

Answer: (a) $\frac{2}{3}$
$\alpha + 7\alpha = 8\alpha = \frac{8}{3}$
$\alpha = \frac{1}{3}$
$k = \frac{2}{3}$

Question 11.
Let, α, s, v be the zeroes of $x^3 + 4x^2 + x - 6$ such that product of two of the zeroes is 6. Find the third zero.
(a) 6
(b) 2
(c) 4
(d) 1

Answer: (a) 6
$\alpha\ s\ v = 6$,
$\alpha s = 61$
=> $v = 6$

Question 12.
If a, s are the zeroes of $x^2 - 8x + \lambda$, such
that $\alpha - s = 2$, then X =
(a) 8
(b) 22

(c) 60
(d) 15

Answer: (d) 15
$\alpha + s = 8$,
$\alpha s = \lambda$
$\alpha - s = 2$
=> $(\alpha - s)2 = 4$
=> $\alpha^2+s^2-2\alpha s = 4$
=> $(\alpha + s)^2 - 4as = 4$
=> $64 — 4\lambda = 4$
=> $4\lambda. = 60$
=> $X = 15$

Question 13.
Find a and b so that the polynomial $6x^4 + 8x^3 - 5x^2 + ax + b$ is exactly divisible by $2x^2 - 5$.
(a) a = 20, b = – 25
(b) a = 4, b = – 5
(c) a = 20, b = 5
(d) a = – 20, b = – 25

Answer: (d) a = – 20, b = – 25
Divide the given polynomial by 2×2 – 5 get the remainder as (20 + a)x + (b + 25) which should be zero

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Question 14.
If α, s are the zeroes of $p(x) = 2x^2 - 5x + 7$, write a polynomial with zeroes 2α+3s and 3α+2s.
(a) $k(x^2 + \frac{5}{2}x - 41)$
(b) $k(x^2 - \frac{5}{2}x + 41)$
(c) $k(x^2 - \frac{5}{2}x - 41)$
(d) $k(- x^2 + \frac{5}{2}x + 41)$

Answer: (b) $k(x^2 - \frac{5}{2}x + 41)$
$\alpha + s = \frac{5}{2}$
$\alpha s = \frac{7}{2}$
$k(x^2 - \frac{5}{2}x + 41)$

Question 15.
If sum of the two zeroes of a cubic polynomial $x^3 - ax^2 + bx - c$, is zero, then which of the following is true:
(a) ab = c
(b) a – b = c
(c) ab = $\frac{c}{2}$
(d) a = $\frac{b}{c}$

Answer: (a) ab = c
Let, α, s, v be the roots =α + s + v = a
v = a
now v is a zero
ab = c

Question 16.
If a, s are the zeroes of $p(x) = 2x^2 + 5x + k$ such that, $\alpha^2 + s^2 + \alpha s = \frac{21}{4}$, then k equals,
(a) 12
(b) 4
(c) 2
(d) – 12

Answer: (c) 2
$\alpha + s = -\frac{5}{2}$
$\alpha s = \frac{k}{2}$
$\alpha^2 + s^2 + \alpha s = \frac{21}{4}$
$(\alpha + s)^2 - \alpha s = \frac{21}{4}$
$\frac{25}{4} - \frac{k}{2} = \frac{21}{4}$
k = 2

Question 17.
If α, s are the zeroes of $x^2 + px + q$, then a polynomial having zeroes $\frac{1}{\alpha}$ and $\frac{1}{s}$ is,
(a) $x^2 + px + q$
(b) $x^2 + qx + p$
(c) $px^2 + qx + 1$
(d) $qx^2 + px + 1$

Answer: (d) $qx^2 + px + 1$
$\alpha + s = -p$

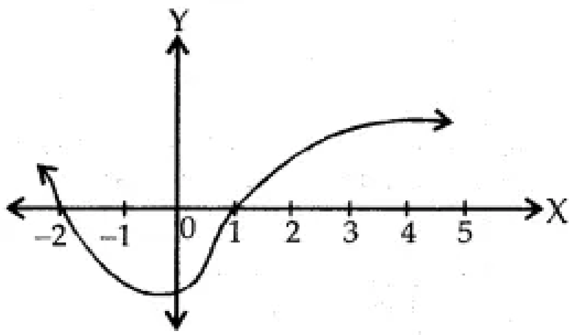
$\alpha s = q$

$$S = \frac{1}{\alpha} + \frac{1}{s} = \frac{\alpha + s}{\alpha s} = \frac{-p}{q}$$

$$P = \frac{1}{\alpha} . \frac{1}{s} = \frac{1}{q}$$

$$k\left(x^2 + \frac{p}{q}x + \frac{1}{q}\right) = \frac{k}{q}\left(qx^2 + px + 1\right)$$

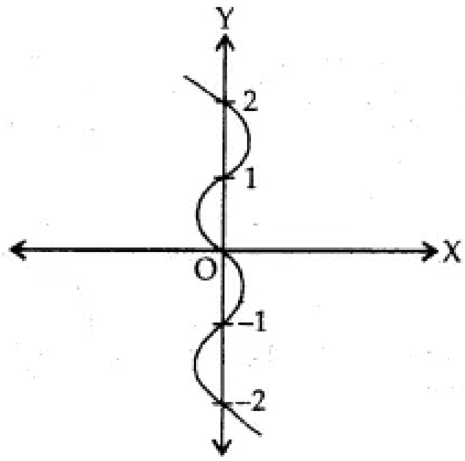
Question 18.
Find the number of zeros in the graph given:



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

Answer: (b) 2
Since the graph meets X-axis at two points -2 and 1, thus it has 2 zeroes.

Question 19.
Write the zero of the polynomial p(x), whose graph is given :



(a) 1
(b) 0
(c) – 1
(d) – 2

Answer: (b) 0
Since the graph meets X-axis at x = 0
=> Zero of p(x) is 'O' => Correct option is (b).

Question 20.
If α, s, v are the zeros of the polynomial $2x^3 – x^2 + 3x - 1$, find the value of (αsv) + (αs + sv + vα).
(a) 2
(b) $\frac{3}{2}$
(c) $\frac{1}{2}$
(d) 0

Answer: (a) 2
$p(x) = 2x^3 – x^2 + 3x - 1$
$\alpha sv = – d/a = \frac{1}{2}$
$\alpha s + sv + v\alpha = c/a = \frac{3}{2}$
$\alpha s + sv + v\alpha + \alpha sv = \frac{3}{2} + \frac{1}{2} = 2$

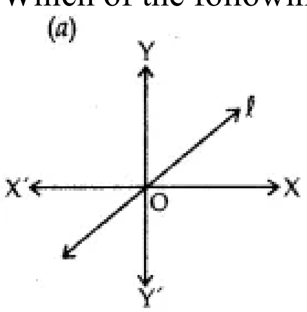
Question 21.
If the zeros of the polynomial $x^3 – 3x^2 + x + 1$ are p – q,p and p + q. Find the value of q.
(a) 1
(b) 0
(c) 2
(d) ±√2

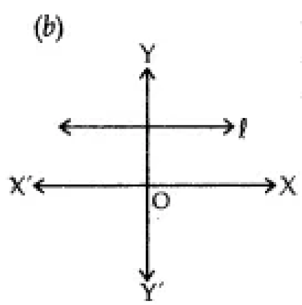
Answer: (d) $\pm\sqrt{2}$
$x^3 - 3x^2 + x + 1$
zeroes are p – q,p,p + q
sum of zeroes = (p – q) + p + (p + q)
= 3p
= 3
$\alpha + s + v = \frac{-b}{a}$
further = $\alpha s + sv + v\alpha = \frac{c}{a}$
(p – q) p + p(p + q) + (p – q)(p + q)=1
q = $\pm\sqrt{2}$

Question 22.
A quadratic polynomial has :
(a) at least 2 zeros
(b) exactly 2 zeros
(c) at most 2 zeros
(d) exactly 1 zero

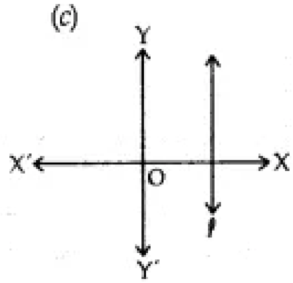
Answer: (c) at most 2 zeros
A quadratic polynomial has atmost two zeroes.

Question 23.
Which of the following Linear Graphs has no zero?

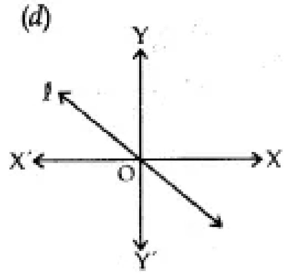




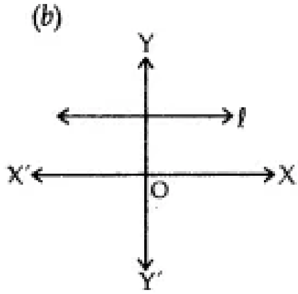
(c)



(d)



(b)



Answer:
as it does not meet X axis.

Question 24.
If α, s are the roots of $cx^2 - bx + a = 0$ (c 0), then α + s is:
(a) $\frac{-b}{a}$
(b) $\frac{b}{a}$
(c) $\frac{c}{a}$
(d) $\frac{b}{c}$

Answer: (d) $\frac{b}{c}$
sum of the roots = $-\frac{coefficient of x}{coefficient of x^2} = \frac{b}{c}$

Question 25.
If P(x) and D(r) are any two polynomials such that D(x) ≠ 0, there exists unique polynomial Q(x) and R(x) such that, P(x) = D(x). Q(x) + R(x) where :

(a) $R(x) = 0$ and $\deg R(x) > \deg Q(x)$
(b) $R(x) = 0$ or $\deg R(x) > \deg D(x)$
(c) $\deg R(x) < \deg Q(x)$
(d) $R(x) = 0$ or $\deg R(x) < \deg D(x)$

Answer: (b) $R(x) = 0$ or $\deg R(x) > \deg D(x)$
division algorithm

Question 26.
When we divide $x^3 + 5x + 7$ by $x^4 – 7x^2 – 6$ then quotient and remainder are (respectively):
(a) $0, x^3 + 5x + 7$
(b) $x, 2x + 3$
(c) $1, x^4 – 7x^2 - 6$
(d) $x^2, 4x – 9$

Answer: (a) $0, x^3 + 5x + 7$
Degree of the divisor is more than the degree of the dividend = quotient is zero and the remainder is $x^3 + 5x + 7$

Question 27.
The value of b, for which $2x^3 + 9x^2 – x – b$ is exactly divisible by $2x + 3$ is:
(a) -15
(b) 15
(c) 9
(d) – 9

Answer: (b) 15
when $2x^3 + 9x^2 – x – b$ is divided by $2x + 3$, remainder is $– b + 15$

Question 28.
If α and s are two zeros of the polynomial p(x), then which of the following is a factor of p(x):
(a) $(x – \alpha)(x – s)$
(b) $(x + \alpha)(x + s)$
(c) $k(x – \alpha)$
(d) $k(x - s)$

Answer: (a) $(x – \alpha)(x – s)$
if α, s are the zeros of p(x), then $(x – \alpha)(x – s)$ is a factor of p(x).

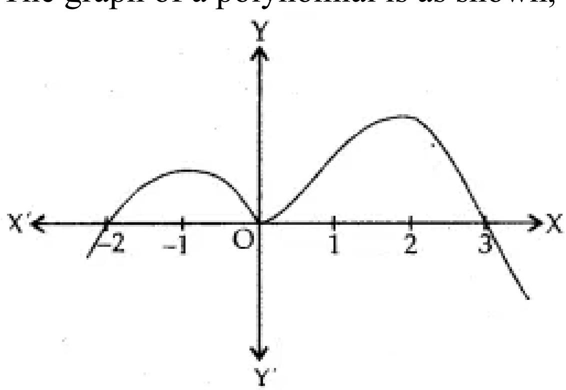
Question 29.
Find a cubic polynomial with the sum, sum of the product of its zeros taken two at a time and the product of its zeros as -2, +5, -3, respectively.
(a) $2x^3 + 5x^2 + x + 3$
(b) $4x^3 + 5x^2 - 3x + 7$
(c) $x^3 + 2x^2 + 5x + 3$
(d) $2x^3 + 5x^2 + 3x + 1$

Answer: (c) $x^3 + 2x^2 + 5x + 3$
Let the polynomial be $ax^3 + bx^2 + cx + d$
$-b/a = -2$
$c/a = 5$
$-d/a = -3$
$a = 1$, $b = 2$, $c = 5$ and $d = 3$
required polynomial is $x^3 + 2x^2 + 5x + 3$

Question 30.
Write a polynomial with zeros 1, – 1 and 1.
(a) $x^3 + x^2 + x + 1$
(b) $x^3 - x^2 + x + 1$
(c) $x^3 - x^2 - x - 1$
(d) $x^3 - x^2 - x + 1$

Answer: (d) $x^3 - x^2 - x + 1$
zeros are 1, – 1 and 1.
required polynomial is
$k(x - 1)(x + 1)(x - 1)$
$= x^3 - x^2 - x + 1$

Question 31.
The graph of a polynomial is as shown, find the polynomial



(a) $k(x^2 - x - 6)$

(b) $k(x^3 + x^2 + 6x)$
(c) $k(x^3 – x^2 – 6x)$
(d) $k(x^3 – 6x)$

Answer: (c) $k(x^3 – x^2 – 6x)$
zeros are – 2,0, and 3
required polynomial = k(x – 2)(x – 0)(x – 3)
= $k(x^3 – x^2 – 6x)$

Question 32.
If α, s and v are the zeroes of the polynomial $2x^3 – x^2 + 3x – 1$, find the value of => (as + sv + va + asv $)^2$
(a) $\frac{3}{2}$
(b) $\frac{5}{2}$
(c) $\frac{1}{2}$
(d) 4

Answer: (d) 4
αs + sv + vα + αsv = $\frac{3}{2} + \frac{1}{2}$ = 2
(αs + sv + vα + αsv $)^2$ = 4

Question 33.
If 2 ± √3 are the two zeros of a polynomial then the following is a factor:
(a) $x^2 – 4x + 1$
(b) $x^2 + 4x – 1$
(c) $4x^2 + x – 1$
(d) $4x^2 – x + 1$

Answer: (a) $x^2 – 4x + 1$
If a, s are the zeroes => (x – α) (x – s) is a factor
=> (x – (2 + √3)) (x – (2 – √3))is a factor
=> x2 – 4x + 1 is a factor.

Question 34.
If 2 is a zero of $p(x) = x^2 + 3x + k$, find k:
(a) 10
(b) 5
(c) – 3
(d) – 10

Answer: (d) – 10
$p(x) = x^2 + 3x + k$
$p(2) = 0$
$\Rightarrow 4 + 6 + k = 0$
$= k = -10$

Question 35.
Given that two of the zeroes of the polynomial, $x^3 + px^2 + rx + s$ are 0, then third zero
(a) 0
(b) $\frac{p}{r}$
(c) $\frac{-p}{r}$
(d) $\frac{p}{q}$

Answer: (c) $\frac{-p}{r}$
Two zeroes are zero, let third zero = α
=> Sum of the roots = α + 0 + 0
$\frac{Coefficient of x^2}{Coefficient of x^3}$

Question 36.
Given that one of the zeroes of the polynomial $ax^3 + bx^2 + cx + d$ is zero, then the product of the other two zeroes is:
(a) $\frac{-c}{a}$
(b) $\frac{c}{a}$
(c) 0
(d) $\frac{-b}{a}$

Answer: (b) $\frac{c}{a}$
$\alpha s + sv + v\alpha = \frac{c}{a}$
now $\alpha = 0$
$0 + sv + 0 = \frac{c}{a}$
$sv = \frac{c}{a}$

Question 37.
The number of polynomials having zeroes – 1 and – 5 is :
(a) 2
(b) 3

(c) 1
(d) More than 3.

Answer: (d) More than 3.
n – number of polynomials can have zeroes -1 and -5.

Question 38.
The graph of the polynomial f(x) = 2x – 5 intersects the x – axis at
(a) $(\frac{5}{2}, 0)$
(b) $(\frac{-5}{2}, 0)$
(c) $(\frac{-5}{2}, \frac{5}{2})$
(d) $(\frac{5}{2}, \frac{-5}{2})$

Answer: (a) $(\frac{5}{2}, 0)$

Question 39.
If the zeroes of the quadratic polynomial $Ax^2 + Bx + C$, C # 0 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

Answer: (b) A and C have the same sign

Question 40.
The number of polynomials having zeroes as 4 and 7 is
(a) 2
(b) 3
(c) 4
(d) more than 4

Answer: (d) more than 4

Question 41.
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

Answer: (a) b – a + 1

Question 42.
The number of zeros of a cubic polynomial is
(a) 3
(b) at least 3
(c) 2
(d) at most 3

Answer: (d) at most 3

Question 43.
Find the quadratic polynomial whose zeros are 2 and -6
(a) $x^2 + 4x + 12$
(b) $x^2 – 4x – 12$
(c) $x^2 + 4x – 12$
(d) $x^2 – 4x + 12$

Answer: (c) $x^2 + 4x – 12$

Question 44.
If 5 is a zero of the quadratic polynomial, $x^2 – kx – 15$ then the value of k is
(a) 2
(b) -2
(c) 4
(d) – 4

Answer: (a) 2

Question 45.
The number of polynomials having zeroes as -2 and 5 is
(a) 1
(b) 2
(c) 3
(d) more than 3

Answer: (d) more than 3

Question 46.
The zeroes of the quadratic polynomial $x^2 + 1750x + 175000$ are
(a) both negative
(b) one positive and one negative
(c) both positive
(d) both equal

Answer: (a) both negative

Question 47.
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

Answer: (d) a – 0, b = -6

Question 48.
Sum and the product of zeroes of the polynomial $x^2 + 7x + 10$ is
(a) $\frac{10}{7}$ and $\frac{-10}{7}$
(b) $\frac{7}{10}$ and $\frac{-7}{10}$
(c) -7 and 10
(d) 7 and -10

Answer: (c) -7 and 10

Question 49.
If x = 2 and x = 3 are zeros of the quadratic polynomial $x^2 + ax + b$, the values of a and b respectively are :
(a) 5, 6
(b) – 5, – 6
(c) – 5, 6
(d) 5, – 6

Answer: (c) – 5, 6

Question 50.
The zeroes of the quadratic polynomial $3x^2 – 48$ are
(a) both negative
(b) one positive and one negative
(c) both positive
(d) both equal

Answer: (b) one positive and one negative

Question 14.
The zeroes of the quadratic polynomial $x^2 + kx + k, k \neq 0$,
(a) cannot both be positive
(b) cannot both be negative
(c) are always unequal
(d) are always equal

Answer: (a) cannot both be positive

Question 51.
The sum and product of the zeroes of the polynomial x^2-6x+8 are respectively
(a) $\frac{-3}{2}$ and – 1
(b) 6 and 8
(c) $\frac{-3}{2}$ and 1
(d) $\frac{3}{2}$ and 1

Answer: (b) 6 and 8

Question 52.
If the point (5,0), (0-2) and (3,6) lie on the graph of a polynomial. Then which of the following is a zero of the polynomial?
(a) 5
(b) 6
(c) not defined
(d) -2

Answer: (a) 5

Question 53.
If a and ß are the zeroes of the polynomial $5x^2 - 7x + 2$, then sum of their reciprocals is:
(a) $\frac{14}{25}$
(b) $\frac{7}{5}$
(c) $\frac{2}{5}$
(d) $\frac{7}{2}$

Answer: (d) $\frac{7}{2}$

Question 54.
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

Answer: (b) -10

Question 55.
The zeroes of the quadratic polynomial $x^2 + px + p$, $p \neq 0$ are
(a) both equal
(b) both cannot be positive
(c) both unequal
(d) both cannot be negative

Answer: (b) both cannot be positive

Question 56.
The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are
(a) both positive
(b) both negative
(c) one positive and one negative
(d) both equal

Answer: (b) both negative

Fill in the blanks:

1. A quadratic equation can have ________ two roots, (exactly/atleast/atmost)

Answer: atmost

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2. If a is a zero of p(x), then ________ is a factor of p(x).

Answer: (x – α)

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3. The sum of the zeroes of a cubic polynomial is ______

Answer: $-\frac{coefficient of x^2}{coefficient of x^3}$

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4. Division Algorithm for polynomials states that, Dividend = _________ x _________ + Remainder.

Answer: Divisor × coefficient

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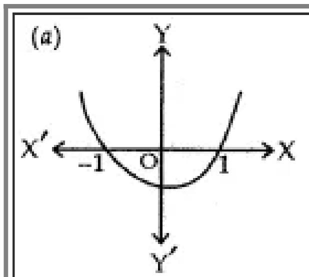
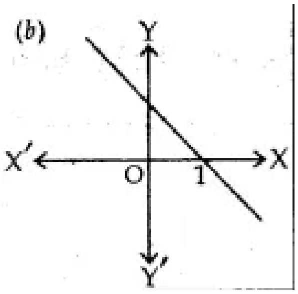
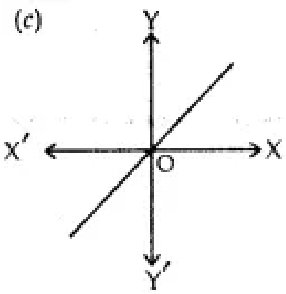
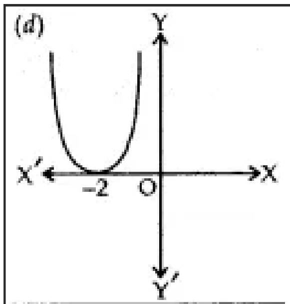
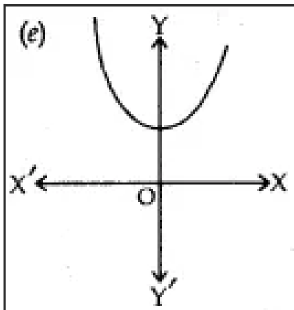
5. If a polynomial p(x) does not touch _______ axis, then it has no zeroes.

Answer: X – axis

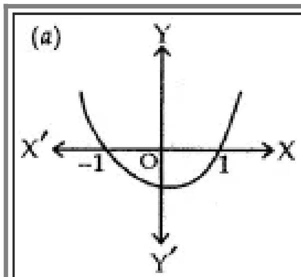
Match the following:

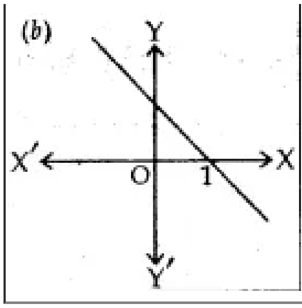
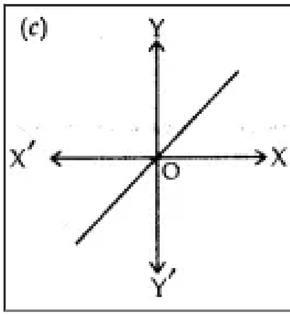
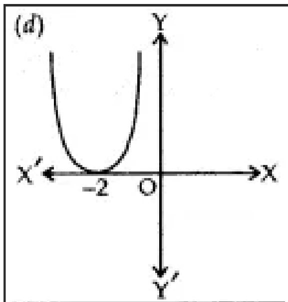
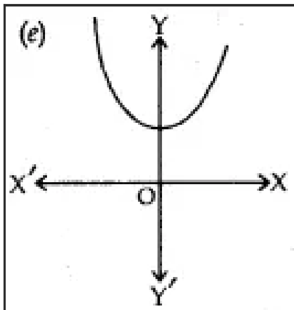
Question 1.

	Linear polynomial (one zero)	Touches x axis at one point only -2
	Quadratic Polynomial (2 zeros)	intersects X-axis at x = l.

		
	Quadratic Polynomial (no zero)	Does not meet X-axis.
	Linear Polynomial (One zero)	Passes through origin.
	Quadratic Polynomial (One zero)	Meets X- axis at 2 points x = 1 and x = -l

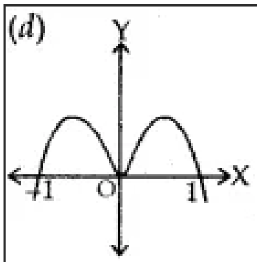
Answer:

	Quadratic Polynomial (2 zeros)	Meets X- axis at 2 points x = 1 and x = -l

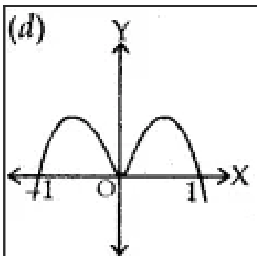
	Linear Polynomial (One zero)	intersects X-axis at x = l.
	Linear Polynomial (One zero)	Passes through origin.
	Quadratic Polynomial (one zero)	Meets X- axis at -2
	Quadratic Polynomial (no zero)	Does not meet X-axis.

Question 2.

(a) p(x) = ax + b	No. of Zeroes = 3	3 Zeroes	αsv= $-\frac{d}{a}$
(b) q(x) = $ax^2 + bx + c$ (a ≠ 0)	Cubic Polynomial	2 Zeroes	Sum of the zeroes = 0
(c) r(x) = $ax^3 + bx^2 +$	Linear	Meets X-axis at 3	α + s = $-\frac{b}{a}$

cx + d(a≠ 0)	Polynomial		
	Quadratic Polynomial	One zero	$-\frac{b}{a}$

Answer:

(a) p(x) = ax + b	Linear Polynomial	One zero	$-\frac{b}{a}$
(b) q(x) = ax^2 + bx +c (a ≠ 0)	Quadratic Polynomial	2 Zeroes	α + s = $-\frac{b}{a}$
(c) r(x) = ax^3 + bx^2 + cx + d(a≠ 0)	Cubic Polynomial	3 Zeroes	αsv= $-\frac{d}{a}$
	No. of Zeroes = 3	Meets X-axis at 3	Sum of the zeroes = 0