MATHS

BOOKS - ZEN MATHS (KANNADA ENGLISH)

POLYNOMIALS

Illustrative Example

1. Find the zero of the polynomial in each of the following cases.

(i) $p(x) = x + 5$

(ii) $p(x) = x - 5$

(iii) $p(x) = 2x + 5$

(iv) $p(x) = 3x - 2$

(v) $p(x) = 3x$

(vi) $p(x) = ax, a \neq 0$

(vii) $p(x) = cx + d, c \neq 0, c, d$ are real numbers

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2. If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are $a - b, a, a + b,$ find a

and b.

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3. Find the zeros of f(x) $= x^3 - 5x^2 - 2x + 24$, if the product of its two zeros is 12 .

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4. If zeros of $f(x) = x^3 - 12x^2 + 39x + k$ are in AP, find k.

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5. Obtain all zeros of a polynomial $f(x) = 3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeros are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

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6. Using Division Algorithm prove that the polynomial $g(x) = x^2 + 3x + 1$ is a factor of $f(x) = 3x^4 + 5x^3 - 7x^2 + 2x + 2$

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7. What must be (a) subtracted from (b) added to f(x) $= 8x^4 + 14x^3 - 2x^2 + 7x - 8$ so that resulting polynomial is exactly divisible by $4x^2 + 3x - 2$?

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8. Find k so that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$. Also find all the zeros of the two polynomials.

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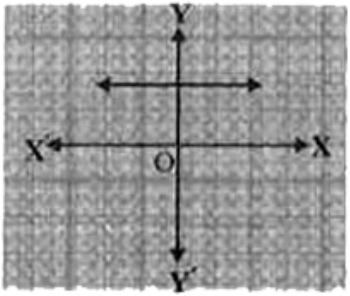
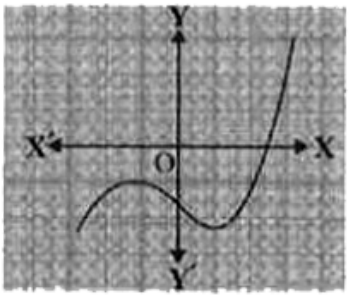
Textual Exercise Exercise 9 1

1. (i) The graphs of y p(x) are given in Fig. below, for some polynomials p(x). Find the number of zeroes of p(x), in each case.



(i)



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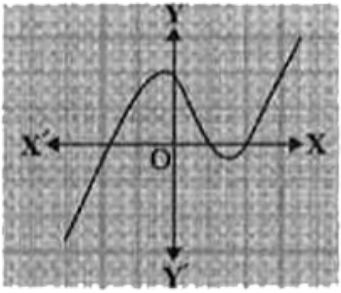

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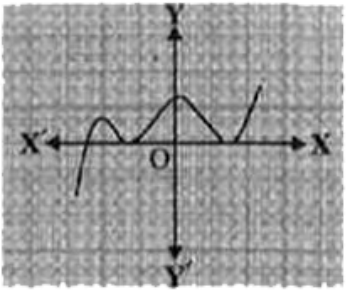

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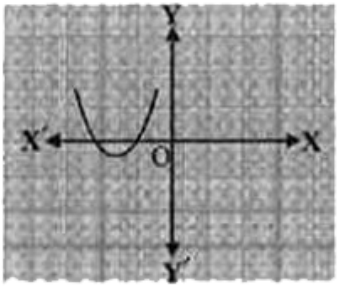

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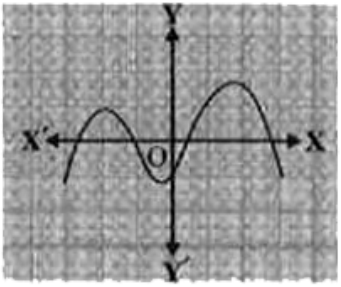

(v)

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Textual Exercise Exercise 9 2

1. Find the zeroes of the following quadratic polynomials and varify the relationship between the zeroes and the coefficients.

$t^2 - 25$

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2. Find a quadratic polynomial each with the given number as the sum and product of its zeroes re-spectively.

i] $\frac{1}{4}, -1$

ii] $\sqrt{2}, \frac{1}{3}$

iii] $0, \sqrt{5}$

iv] 1,1

v] $-\frac{1}{4}, \frac{1}{4}$

vi] 4,1

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Textual Exercise Exercise 9 3

1. Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in each of the following :

i] $p(x) = x^3 - 3x^2 + 5x - 3, g(x) = x^2 - 2$

ii]

$p(x) = x^4 - 3x^2 + 4x + 5, g(x) = x^2 + 1 - x$

iii] $p(x) = x^4 - 5x + 6g(x) = 2 - x^2$

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2. Check whether the first polynomial is a factor of the second polynomial by dividing :

$t^2 - 3, 2t^4 + 3t^3 - 2t^2 - 9t - 12$

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3. Obtain all other zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

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4. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial g(x), the quotient and remainder were x-2 and -2x+4, respectively. Find g(x).

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5. Give examples of polynomials p(x), g(x), q(x) and r(x), which satisfy the division algorithm and

deg p(x) = deg q(x)

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Textual Exercise Exercise 9 4 Optional

1. Verify that the number given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in each case.

i] $2x^3 + x^2 - 5x + 2, \frac{1}{2}, 1, -2$

ii] $x^3 - 4x^2 + 5x - 2, 2, 1, 1$

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2. Find a cubic polynomial with the sum, sum of the product of its zeroes taken two at a time, and the product of its zeroes as 2, -7, -14 respectively.

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3. If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are $a - b, a, a + b$, find a and b.

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4. If the zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$ Find other zeroes.

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5. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be x + a, find k and a.

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Zen Additional Questions Multiple Choice Questions Mcqs

1. When a bi-quadratic polynomial is divided by a linear polynomial, the degrees of the quotient and remainder polynomials are .

A. 2,2

B. 3,1

C. 3,0

D. 1,1

Answer: C

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2. The number of zeros that $f(x) = (x-2)^2 + 4$ can have is

A. 1

B. 2

C. 0

D. 3

Answer: B

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3. The quadratic polynomial whose sum of zeros is 3 and product of zeros is -2 is

A. $x^2 + 3x - 2$

B. $x^2 - 2x + 3$

C. $x^2 - 3x + 2$

D. $x^2 - 3x - 2$

Answer: D

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4. If f(x) is a polynomial of degree ≥ 1 and $f(\alpha) = 0, \alpha$ is called

A. Degree of f(x)

B. Zero of the polynomial

C. Constant of the polynomial

D. Value of the polynomial

Answer: B

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5. A polynomial of degree n has

A. Only one zero

B. Exactly n zeros

C. Utmost n zeros

D. More than n zeros

Answer: B

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6. If two zeros of a quadratic polynomial are equal in magnitude but opposite in sign and their product is -25, the polynomial is

A. $x^2 - 25$

B. $x^2 - 5$

C. $x^2 - 25x$

D. $x^2 + 25$

Answer: A

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7. If the graph of a polynomial f(x) does not intersect the x-axis but cuts the y-axis at one point, number of zeros of f(x) is

A. 0

B. 1

C. 0 or 1

D. None of these

Answer: A

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8. The third zero of a polynomial $f(x) = 2x^3 + 3x^2 - 5x + 10$ whose product to two zeros is 5.

A. 1

B. -1

C. 5

D. 0

Answer: B

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9. If the zeros of $p(x) = 8z^2 + 15x - k$ are reciprocals, the value of k is

A. 1

B. 0

C. -8

D. 8

Answer: C

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10. α, β and γ are zeros of the cubic polynomial $kx^3 - 5x + 9$. If $\alpha^3 + \beta^3 + \gamma^3 = 27$, value of k is

A. 1

B. 3

C. -1

D. 9

Answer: C

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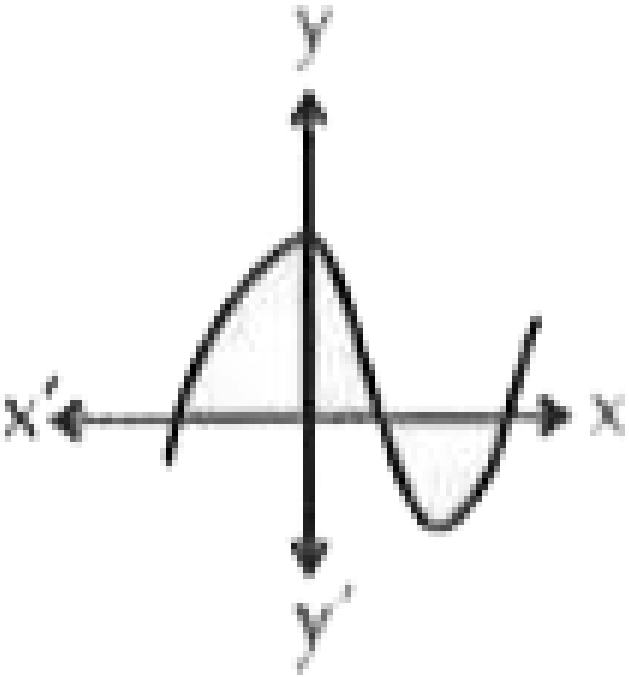
11. In the given graph of y = P(x) , the number of zeros is



A. 4

B. 3

C. 2

D. 7

Answer: B

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12. The degree of a linear polynomial is

A. 0

B. 1

C. 2

D. 3

Answer: B

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Zen Additional Questions Very Short Answer Vsa Type Questions

1. $x^2 - 5 = 1(x)$

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2. $4x^2 - 12x + 9 = g(x)$

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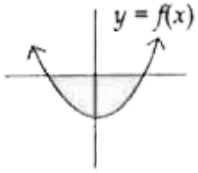
3. Identify the degree of the polynomial, given that the following are graphs corresponding to linear, quadratic, and cubic polynomials.

i]



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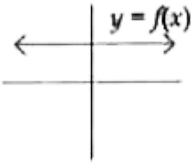

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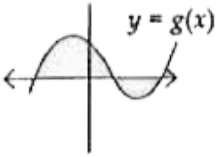

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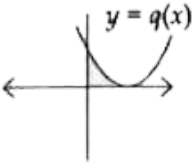

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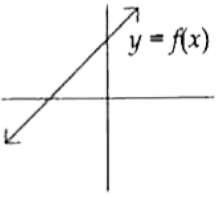

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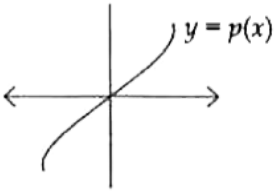

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4. If one zero of $f(x) = 4x^2 - 8kx - 9$ is negative of the other, find k.

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5. Write the quadratic polynomial whose zeros are $-\frac{1}{4}$ and 1

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6. If the product of zeros of a quadratic polynomial p(x) = $x^2 - 4x + k$ is 3, find k,

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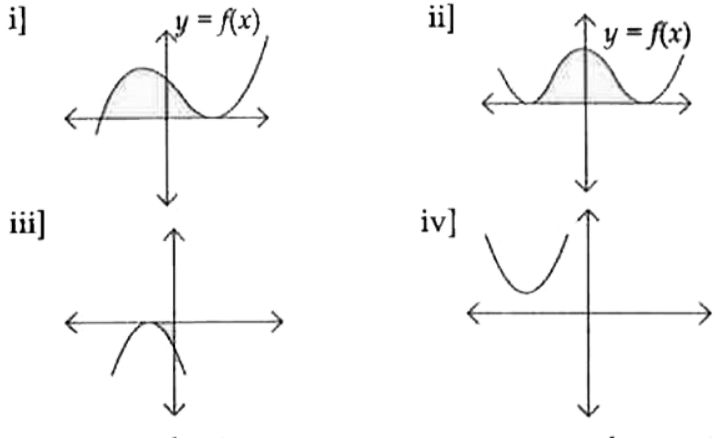
7. Write the number of real zeros of f(x) depicted by graphs shown below :



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8. Given a quadratic polynomial whose sum of zeros is $2\sqrt{3}$ and their product is 2 .

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9. Find a quadratic polynomial whose zeros are $3+\sqrt{2}$ and $3-\sqrt{2}$.

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10. Find the zeroes of the polynomial P (x) = $x^2 - 3$

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11. Write the degree of the polynomial P (x) = $2x^3 - x^2 + 5$

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12. Write the degree of the polynomial $P(x) = x^3 + 2x^2 - 5x - 6$

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Zen Additional Questions Very Short Answer Vsa Type Questions Answer The Following Questions

1. Identify the polynomials from the 10 algebraic equations given above. Give reason why some of them are not polynomials.

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2. Pick the constant polynomials. Find the zeros of this polynomials ?

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3. Mention the degrees of the polynomials given :

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4. Find h(1) and g(2)

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5. Rewrite p(x) and h(x) in their standard form .

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6. Find zeros of l(x) ,g(x) ,q(x), m(x) .

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7. Which is the leading term in p(x) and h(x) ?

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8. What kind of a polynomial is l(x) ?

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9. Write the coefficients present in the polynomial of degree 5 .

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10. How many zeros does q(x) have ?

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Zen Additional Questions Short Answer Sa Type I Questions

1. Find the zeros of these polynomials and verify the relationship between zeros and coefficients.

i] $f(x) = x^2 - \left(\sqrt{3} + 1\right)x + \sqrt{3}$

ii] $f(v) = v^2 + 4\sqrt{3}v - 15$

iii] $q(y) = 7y^2 \frac{11}{3} y - \frac{2}{3}$

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2. If α and β are zeros of the quadratic polynomial $f(x) = x^2 - p(x+1) - c$, show that $(\alpha + 1)(\beta + 1) = 1 - c$

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3. If α and β are zeros of $x^2 - 2x + 3$, find a polynomial whose zeros are :

i] $\alpha + 2, \beta + 2$

ii] $\frac{\alpha - 1}{\alpha + 1}, \frac{\beta - 1}{\beta + 1}$

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4. If two zeros of a polynomial $p(x) = x^3 - 4x^2 - 3x + 12$ are $\sqrt{3}$ and $-\sqrt{3}$, find its 3 rd zero .

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5. Find the condition which must be satisfied by the zeros of $f(x) = x^3 - px^2 + qx - r$, when the sum of its two zeros is zero .

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6. (i) Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in this case:

$2x^2 + x^2 - 5x + 2, \frac{1}{2}, 1, -2$

(ii) Verify that the numbers given alongside of

the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in this case:

$x^3 - 4x^2 + 5x - 2, 2, 1, 1$

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7. If α and β are zeros of polynomial $2x^2 + 7x + 5$ find $\alpha + \beta + \alpha\beta$.

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8. If α and β are zeros of $p(x) = 4x^2 + 3x + 7$, find $\frac{1}{\alpha} + \frac{1}{\beta}$.

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9. If one zero of $f(x) = \left(k^2 + 4\right)x^2 + 13x + 4k$ is the reciprocal of the other, find k

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10. If $\alpha, \beta,$ and γ are the zeroa od $f(x) = ax^3 + bx^2 + cx + d$, find $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$

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11. If $\alpha, \beta,$ and γ are the zeros of $2x^3 - 4x^2 + 6x + 9$, find value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$

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12. If zeros of a quadratic polynomial $x^2 + (a+1)x + b$ are 2 and -3, find a and b .

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13. Find zeros of polynomials by the algebraic method and verify the relationship between the zeros and coefficient of the polynomial $t^3 - 2t^2 - 15t$

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14. Given f(x+1) = 3x +5 , evaluate f(-2) and f(x)

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15. If the product of the zeros of a polynomial $(ax^2 - 6x - 6)$ is 4, find the value of a.

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16. If α and β are the zeros of the quadratic polynomial $4x^2 + 4x + 1$,find the quadratic polynomial whose zeros are 2α and 2β .

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17. Find values of p for which the quadratic polynomial $4x^2 + px + 3$ has equal zeros .

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18. Find a if one zero of $\left(a^2 + 9\right)x^2 + 13x + 6a$ is a reciprocal of the other.

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19. If two zeros of $f(x) = x^3 - 4x^2 - 3x + 12are\sqrt{3}$ and $-\sqrt{3}$, find its third zero.

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20. Without solving, find the value of m for which the zeros are equal for $f(x) = x^2 + 2(m-1)x + m + 5$

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21. Find values of k for which $(k+4)x^2+(k+1)x+1$ has equal zeros.

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22. The sum and product of the zeroes an a quadratic polynomial P (x) = ax^2+bx+c are -3 and 2 respectively, Show that b+c = 5a.

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23. Find the quotient and the remainder when P (x) = $3x^3 + x^2 + 2x + 5$ is divided by g(x) = x^2 +2x+1.

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24. Sum and product of the zeroes of a quadratic polynomial $P(x) = ax^2 + bx - 4$ are $\frac{1}{4}$ and -1 respectively. Then find the values of a and b .

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25. Find the value of k of polynomial $P(x) = x^2 - x - (2k + 2)$ in which one of its zeroes is - 4

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26. If one zero of the polynomial $p(x) = x^2 - 6x + k$ is twice the other then find the value of k .

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27. Find the polynomial of least degree that should be subtracted from $p(x) = x^3 - 2x^2 + 3x + 4$ so that it is exactly divisible by $g(x) = x^2 - 3x + 1$

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Zen Additional Questions Short Answer Sa Type Ii Questions

1. Find a quadratic polynomial whose sum and product, respectively, of zeros are given. Also

find the zeros.

i] $-\frac{3}{2\sqrt{15}}, -\frac{1}{2}$

ii] $\frac{21}{8}, \frac{5}{16}$

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2. If α and β are zeros of $f(x) = 6x^2 + x = 2$

find the value fo $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

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3. If α and β are zeros of polynomial $f(x) = x^2 + px + q$, form a polynomial whose zeros are $(\alpha + \beta)^2 are (\alpha - \beta)^2$.

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4. Find a cubic polynomial with sum, sum of product of its zeros taken two at a time, and product of its zeros being 3,-1, and -3 respectively.

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5. If zeros of a polynomial $f(x) = ax^3 + 3bx^2 + 3cx + d$ are in AP prove that $2b^3 - 3abc + a^2d = c$.

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6. If $f(x) = x^3 + x^2 - ax + b$ is divisible by $x^2 - x$, find values of a and b .

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7. If two of the zeros of a cubic polynomial $ax^3 + bx^2 + cx + d$ are each equal to zero, find the third zero. What can you say of c and d ?

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8. If α and β are zeros of the quadratic polynomial $x^2 - (k+6)x + 2(2k-1)$, find k if $\alpha + \beta = \frac{\alpha\beta}{2}$

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9. If 1 is one of the zeros of the polynomial $7x - x^3 - 6$, find its other zeros.

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10. If zeros of $x^3 - 3x^2 + x + 1$ are a-b, a,a+b, find a and b.

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11. Find the other two zeroes of the polynomial $y^4 + y^3 - 9y^2 - 3y + 18$ if the zeroes are $\sqrt{3}$ and $-\sqrt{3}$

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12. If one of the zeros of $x^3 + ax^2 + bx + c$ is (-1) ,find the product of the other two zeros in terms of a + b

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13. If a and b are the zeros of the quadratic polynomial $f(x) = kx^2 + 4x + 4$ such that $a^2 + b^2 = 24$, find k.

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14. Obtain the zeros of the quadratic polynomial $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ and verify the relation between its zeros and coefficients.

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15. Find a quadratic polynomial whose zeros are 1 and -3 . Verify the relation between its coefficients and zeros.

16. What real number should to subtracted from the polynomial $3x^3 + 10x^2 - 14x + 9$ so that (3x - 2) divides it exactly ?

17. If $f(x) = 6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by $g(x) = 3x^2 + 4x + 1$, the remainder is ax + b . Find a and b.

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Zen Additional Questions Long Answer La Type Questions

1. What must be added to $f(x) = x^4 + 2x^3 - 2x^2 + x - 1$ so that the

polynomial is exactly divisible by $g(x) = x^2 + 2x - 3$?

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2. Check if $g(x) = x^3 - 3x + 1$ is a factor of $p(x) = x^5 - 4x^3 + x^2 + 3x + 1$.

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3. Divide $6 + 19x + x^2 - 6x^3 by 2 + 5x - 3x^2$ and verify division algorithm.

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4. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial g(x), the quotient and remainder were x-2 and -2x+4, respectively. Find g(x).

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5. What must be added to $f(x) = x^4 + 2x^3 - 2x^2 + x - 1$ so that the resulting polynomial is a multiple of $x^2 + 2x - 3$?

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6. Divide $30x^4 + 11x^3 - 82x^2 - 12x + 48$ by ($3x^2 + 2x - 4$) and verify the result by division algorithm.

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7. Find the other zeros of $2x^4 - 10x^3 + 5x^2 + 15x - 12$ given that $\sqrt{\frac{3}{2}}$ and $-\sqrt{\frac{3}{2}}$ are two of its zeros .

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8. If the zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$ Find other zeroes.

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9. If the remainder on dividing $x^3 + 2x^2 + kx + 3$ by x - 3 is 21, find the quotient and the value of k. Hence find the zeros of the polynomial $x^3 + 2x^2 + kx - 18$.

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10. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$, is divided by another polynomial $x^2 - 2x + k$, the reminder comes out to be $x + a$, find k and a.

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11. If α and β be the two zeroes of the quadratic polynomial $p(x) = 2x^2 - 3x + 7$, evaluate .

i] $\alpha^3 + \beta^3$

ii] $\frac{1}{2\alpha - 3} + \frac{1}{2\beta - 3}$

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12. For which values of 'a' and 'b' are the zeroes of $q(x) = x^3 + 2x^2 + a$ also the zeroes of the polynomial

$p(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + b$ **?**

Which zeroes of p(x) are not the zeroes of q(x) ?

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13. Given that zeros of the cubic polynomial $f(x) = x^3 - 6x^2 + 3x + 10$ are the form a, a +b, a + 2b for some a, b $\in$ R, find a and b and the zeros of f(x) .

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Zen Additional Questions Higher Order Thinking Skills Hots

1. (x -2) is a factor of $2x^3 + ax^2 + bx - 14$ and when divided by x-3, the remainder is 52 . Find

the values of a and b .

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2. If 1 is a zero of the polynomial $p(x) = ax^2 - 3(a-1)s - 1$,find value of a.

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3. Find the values of a and b for which zeros of $q(x) = x^3 + 2x^2 + a$ are also the zero of

$p(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + bp$. Also, find zeros of p(x) which are not zeros of q(x) .

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4. If zeros of $f(x) = x^3 - 12^2 + 39x + k$ are in A.P., find k.

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5. Given that zeros of the cubic polynomial $f(x) = x^3 - 6x^2 + 3x + 10$ are the form a, a

+b, a + 2b for some a, b $\in$ R, find a and b and the zeros of f(x) .

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6. If α and β are zeros of $f(t) = t^2 - 4t + 3$, find the value of $\alpha^4\beta^3 + \beta^4\alpha^3$.

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7. If the square of the difference of the zeros of the quadratic polynomial $f(x) = x^2 + px + 45$

is equal to 144, find p.

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8. If α and β are zeros of the quadratic polynomial $f(x) = x^2 - px + q$, prove that $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2} = \frac{p^4}{q^2} - \frac{4p^2}{q} + 2$.

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9. Find a quadratic polynomial whose sum and product of zeros are respectively

$-2\sqrt{3}$ and -9

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10. Find the zeros of $f(x) = 6x^2 - 3$ and verify the relationship between zeros and coefficients.

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Zen Additional Questions Competitive Exam Questions

1. What should be multiplied with $2x^2 + 3x - 4$ to get $4x^4 - 9x^2 + 24x - 16$?

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2. If LCM of f(x) and g(x) is $a^6 - b^6$, theri HCF can be-

A. a-b

B. $a^2 + ab + b^2$

C. $a^2 - ab + b^2$

D. All of these

Answer: D

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3. The LCM of polynomials $12\left(x^3+27\right)$ and $18\left(x^2-9\right)$ is _____

A. 6(x+3)

B. $36\left(x^2-9\right)\left(x^2+3x=9\right)$

C. $36(x+3)^2\left(x^2+3x+9\right)$

D. $36\left(x^2-9\right)\left(x^2-3x+9\right)$

Answer: D

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4. The HCF of polynomials $\left(x^2-4x+4\right)(x+3)$ and $\left(x^2+2x-3\right)(x-2)$ is _____

A. (x+3)

B. (x-2)

C. (x+3)(x-2)

D. $(x+3)(x-2)^2$

Answer: C

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5. If the zeros of (ax+b) (3x+2) are $-\frac{2}{3}$ and $\frac{1}{2}$, a +b = _____

A. -1

B. 0

C. $-b$

D. $-a$

Answer: B