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CLASS - 9

POLYNOMIALS

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EXERCISE 2.1 - Question No. 1

Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer. (i) $4x^2 - 3x + 7$ (ii) $y^2 + \sqrt{2}$ (iii) $3\sqrt{t} + t\sqrt{2}$ (iv) $y + \frac{2}{y}$ (v) $x^{10} + y^3 + t^{50}$

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EXERCISE 2.1 - Question No. 2

Write the coefficients of x^2 in each of the following: (i) $2 + x^2 + x$ (ii) $2 - x^2 + x^3$ (iii) $\frac{\pi}{2}x^2 + x$ (iv) $\sqrt{2}x - 1$

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EXERCISE 2.1 - Question No. 3

Give one example each of a binomial of degree 35. and of a monomial of degree 100.

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EXERCISE 2.1 - Question No. 4

Write the degree of each of the following polynomials: (i) $5x^3 + 4x^2 + 7x$ (ii) $4 - y^2$ (iii) $5t - \sqrt{7}$ (iv) 3

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EXERCISE 2.1 - Question No. 5

Classify the following as linear, quadratic and cubic polynomials: (i)

$x^2 + x$ (ii) $x - x^3$ (iii) $y + y^3 + 4$ (iv) $1 + x$ (v) 3t (vi) r^2 (vii) $7x^3$

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EXERCISE 2.2 - Question No. 1

Find the value of the polynomial $5x - 4x^2 + 3$ at (i)$x = 0$ (ii) $x = -1$

(iii) $x = 2$

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EXERCISE 2.2 - Question No. 2

Find p(0), p(1) and p(2) for each of the following polynomials: (i)

$p(y) = y^2 - y + 1$ (ii) $p(t) = 2 + t + 2t^2 - t^3$ (iii) $p(x) = x^3$ (iv)

$p(x) = (x - 1)(x + 1)$

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EXERCISE 2.2 - Question No. 3

Verify whether the following are zeroes of the polynomial, indicated against them. (i) $p(x) = 3x + 1, x = -\frac{1}{3}$ (ii) $p(x) = 5x - \pi, x = \frac{4}{5}$ (iii) $p(x) = x^2 - 1, x = 1, -1$ (iv) $p(x) = (x + 1)(x + 2), x = -1, 2$ (v) $p(x) = x^2, x = 0$ (vi) $p(x) = lx + m, x = -\frac{m}{l}$ (vii)

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EXERCISE 2.2 - Question No. 4

Find the zero of the polynomial in each of the following eases: (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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EXERCISE 2.3 - Question No. 1

Find the remainder when $x^3 + 3x^2 + 3x + 1$ is divided by (i) $x + 1$ (ii) $x - \frac{1}{2}$ (iii) x (iv) $x + \pi$ (v) $5 + 2x$

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EXERCISE 2.3 - Question No. 2

Find the remainder when $x^3 - ax^2 + 6x - a$ is divided by $x - a$.

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EXERCISE 2.3 - Question No. 3

Check whether $7+3x$ is a factor of $3x^3+7x$.

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EXERCISE 2.4 - Question No. 1

Determine which of the following polynomials has $(x+1)$ a factor. (i)

x^3+x^2+x+1 (ii) $x^4+x^3+x^2+x+1$ (iii) $x^4+3x^3+3x^2+x+1$

(iv) $x^3-x^2-\left(2+\sqrt{2}\right)x+\sqrt{2}$

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EXERCISE 2.4 - Question No. 2

Use the Factor Theorem to determine whether g(x) is a factor of p(x) in each of the following cases: (i) $p(x) = 2x^3 + x^2 - 2x - 1, g(x) = x + 1$ (ii) $p(x) = x^3 + 3x^2 + 3x + 1, g(x) = x + 2$ (iii) $p(x) = x^3 + 4x^2 + x + 6, g(x) = x - 3$

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EXERCISE 2.4 - Question No. 3

Find the value of k, if $x - 1$ is a factor of p(x) in each of the following cases: (i) $p(x) = x^2 + x + k$ (ii) $p(x) = 2x^2 + kx + \sqrt{2}$ (iii) $p(x) = kx^2 - \sqrt{2}x + 1$ (iv) $p(x) = kx^2 - 3x + k$

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EXERCISE 2.4 - Question No. 4

Factorise: (i) $12x^2 - 7x + 1$ (ii) $2x^2 + 7x + 3$ (iii) $6x^2 + 5x - 6$ (iv) $3x^2 - x - 4$

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EXERCISE 2.4 - Question No. 5

Factorise: (i) $x^3 - 2x^2 - x + 2$ (ii) $x^3 - 3x^2 - 9x - 5$ (iii) $x^3 + 13x^2 + 32x + 20$ (iv) $2y^3 + y^2 - 2y - 1$

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EXERCISE 2.5 - Question No. 1

Use suitable identities to find the following products: (i) $(x + 4)(x + 10)$ (ii) $(x + 8)(x - 10)$ (iii) $(3x + 4)(3x - 5)$ (iv) $\left(y^2 + \frac{3}{2}\right)\left(y^2 - \frac{3}{2}\right)$ (v) $(3 - 2x)(3 + 2x)$

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EXERCISE 2.5 - Question No. 2

Evaluate the following products without multiplying directly: (i) 103×107

(ii) 95×96 (iii) 104×96

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EXERCISE 2.5 - Question No. 3

Factorise the following using appropriate identities: (i) $9x^2 + 6xy + y^2$ (ii)

$4x^2 - 4y + 1$ (iii) $x^2 - \frac{y^2}{100}$

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EXERCISE 2.5 - Question No. 4

Expand each of the following, using suitable identities: (i) $(x+2y+4z)^2$

(ii) $(2x-y+z)^2$ (iii) $(-2x+3y+2z)^2$ (iv) $(3a-7b-c)^2$ (v)

$(-2x+5y-3z)^2$ (vi) $\left[\frac{1}{4}a-\frac{1}{2}b+1\right]^2$

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EXERCISE 2.5 - Question No. 5

Factorise: (i) $4x^2+9y^2+16z^2+12xy-24yz-16xz$ (ii)

$2x^2+y^2+8z^2-2\sqrt{2}xy+4\sqrt{2}yz-8xz$

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EXERCISE 2.5 - Question No. 6

Write the following cubes in expanded form: (i) $(2x+1)^3$ (ii) $(2a-3b)^3$

(iii) $\left[\frac{3}{2}x+1\right]^3$ (iv) $\left[x-\frac{2}{3}y\right]^3$

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EXERCISE 2.5 - Question No. 7

Evaluate the following using suitable identities:

$(i)(99)^2$ $(ii)(102)^3$ $(iii)(998)^3$

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EXERCISE 2.5 - Question No. 8

Factorise each of the following: (i) $8a^3 + b^3 + 12a^2b + 6ab^2$ (ii)

$8a^3 - b^3 - 12a^2b + 6ab^2$ (iii) $27 - 125b^3 - 135a + 225a^2$ (iv)

$64a^3 - 27a^3 - 144a^2b + 108ab^2$ (v) $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

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EXERCISE 2.5 - Question No. 9

Verify : (i) $x^3 + y^3 = (x + y)\left(x^2 - xy + y^2\right)$ (ii)

$x^3 - y^3 = (x - y)\left(x^2 + xy + y^2\right)$

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EXERCISE 2.5 - Question No. 10

Factorise each of the following: (i) $27y^3 + 125z^3$ (ii) $64m^3 - 343n^3$

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EXERCISE 2.5 - Question No. 11

Factorise: $27x^3 + y^3 + z^3 - 9xyz$

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EXERCISE 2.5 - Question No. 12

Verify that:

$$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)\left[(x - y)^2 + (y - z)^2 + (z - x)^2\right]$$

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EXERCISE 2.5 - Question No. 13

If $x + y + z = 0$ show that $x^3 + y^3 + z^3 = 3xyz$.

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EXERCISE 2.5 - Question No. 14

Without actually calculating the cubes, find the value of each of the following: (i) $(-12)^3 + (7)^3 + (5)^3$ (ii) $(28)^3 + (-15)^3 + (-13)^3$

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EXERCISE 2.5 - Question No. 15

Give possible expressions for the length and breadth of each of the following rectangles, in which their areas are given: Area: $25a^2 - 35a + 12$ Area: $35y^2 + 13y - 12$ (i) (ii)

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EXERCISE 2.5 - Question No. 16

What are the possible expressions for the dimensions of the cuboids whose volumes are given below? (i) Volume: $3x^2 - 12x$ (ii) Volume: $12ky^2 + 8kx - 20k$

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SOLVED EXAMPLES - Question No. 1

Find the degree of each of the polynomials given below: (i) $x^5 - x^4 + 3$

(ii) $2 - y^2 - y^3 + 2y^8$ (iii) 2

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SOLVED EXAMPLES - Question No. 2

Find the value of each of the following polynomials at the indicated value

of variables: (i) $p(x) = 5x^2 - 3x + 7$ at $x = 1$ (ii)

$q(y) = 3y^3 - 4y + \sqrt{11}$ at $y = 2$ (iii) $p(t) = 4t^4 + 5t^3 - t^2 + 6$ at $t = a$

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SOLVED EXAMPLES - Question No. 3

Check whether -2 *and* 2 are zeroes of the polynomial $x + 2$.

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SOLVED EXAMPLES - Question No. 4

Find a zero of the polynomial $p(x) = 2x + 1$.

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SOLVED EXAMPLES - Question No. 5

Verify whether 2 and 0 are zeroes of the polynomial $x^2 - 2x$.

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SOLVED EXAMPLES - Question No. 6

Divide $p(x)$ by $g(x)$, where p(x) = $p(x) = x + 3x^2 - 1$ and $g(x) = 1 + x$

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SOLVED EXAMPLES - Question No. 7

Divide the polynomial $3x^4 - 4x^3 - 3x - 1$ by $x - 1$

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SOLVED EXAMPLES - Question No. 8

Find the remainder obtained on dividing $p(x) = x^3 + 1$ by $x + 1$

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SOLVED EXAMPLES - Question No. 9

Find the remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by$x - 1$.

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SOLVED EXAMPLES - Question No. 10

Check whether the polynomial $q(t) = 4t^3 + 4t^2 - t - 1$ is a multiple of $2t + 1$

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SOLVED EXAMPLES - Question No. 11

Examine whether $x + 2$ is a factor of $x^3 + 3x^2 + 5x + 6$ and of $2x + 4$.

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SOLVED EXAMPLES - Question No. 12

Find the value of k, if $x - 1$ is a factor of $4x^3 + 3x^2 - 4x + k$.

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SOLVED EXAMPLES - Question No. 13

Factorise $6x^2 + 17x + 5$ by splitting the middle term, and by using the Factor Theorem.

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SOLVED EXAMPLES - Question No. 14

Factorise $y^2 - 5y + 6$ by using the Factor Theorem.

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SOLVED EXAMPLES - Question No. 15

Factorise $x^3 - 23x^2 + 142x - 120$.

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SOLVED EXAMPLES - Question No. 16

Find the following products using appropriate identities:

$(i)\ (x+3)\ (x+3) \qquad (ii)\ (x3)(x+5)$

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SOLVED EXAMPLES - Question No. 17

Evaluate 105×106 without multiplying directly.

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SOLVED EXAMPLES - Question No. 18

Factorise: (i) $49a^2 + 70ab + 25b^2$ (ii) $\frac{25}{4}x^2 - \frac{y^2}{9}$

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SOLVED EXAMPLES - Question No. 19

Write $(3a + 4b + 5c)^2$ in expanded form.

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SOLVED EXAMPLES - Question No. 20

Expand $(4a - 2b - 3c)^2$

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SOLVED EXAMPLES - Question No. 21

Factorise $4x^2 + y^2 + z^2 - 4xy - 3yz + 4xz$.

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SOLVED EXAMPLES - Question No. 22

Write the following cubes in the expanded form:

$(i)(3a+4b)^3 \quad (ii)(5p-3q)^3$

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SOLVED EXAMPLES - Question No. 23

Evaluate each of the following using suitable identities: (i) $(104)^3$ (ii) $(999)^3$

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SOLVED EXAMPLES - Question No. 24

Factorise $8x^3+27y^3+36x^2y+54xy^2$.

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SOLVED EXAMPLES - Question No. 25

Factorise : $8x^3 + y^3 + 27z^3 - 18xyx$.

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