



MATHS

NCERT - NCERT MATHEMATICS(ENGLISH)

POLYNOMIALS

Exercise 2.1

1. Write the degree of each of the following polynomials:(i)

$$5x^3 + 4x^2 + 7x \text{ (ii) } 4 - y^2 \text{ (iii) } 5t - \sqrt{7} \text{ (iv) } 3$$

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

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

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3. 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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4. 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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5. Give one example each of a binomial of degree 35. and of a monomial of degree 100.

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Exercise 2 2

1. 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)

$p(x) = lx + m, x = -\frac{m}{l}$

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

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4. 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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Solved Examples

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

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

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

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4. Write the following cubes in the expanded form:

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

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

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

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

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8. 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) $p(t) = 4t^4 + 5t^3 - t^2 + 6at$

$t = a$

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9. Find the degree of each of the polynomials given below:(i)

$$x^5 - x^4 + 3 \text{ (ii) } 2 - y^2 - y^3 + 2y^8 \text{ (iii) } 2$$

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

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

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

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

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

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

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

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

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

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

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

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

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22. Find the following products using appropriate identities:

(i) $(x + 3)(x + 3)$ (ii) $(x - 3)(x + 5)$

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23. Evaluate 105×106 without multiplying directly.

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

(ii) $(999)^3$

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

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Exercise 2 5

1. 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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2. 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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3. Factorise each of the following: (i) $27y^3 + 125z^3$ (ii) $64m^3 - 343n^3$

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4. 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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5. Factorise the following using appropriate identities: (i)

$9x^2 + 6xy + y^2$ (ii) $4y^2 - 4y + 1$ (iii) $x^2 - \frac{y^2}{100}$

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6. 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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7. Verify : (i) $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$ (ii) $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

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8. 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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9. 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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10. 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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11. Factorise: $27x^3 + y^3 + z^3 - 9xyz$

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12. Evaluate the following using suitable identities:

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

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13. 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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14. 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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15. If $x + y + z = 0$ show that $x^3 + y^3 + z^3 = 3xyz$.

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16. Evaluate the following products without multiplying directly:(i)

103×107 (ii) 95×96 (iii) 104×96

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Exercise 2 3

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

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



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3. 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 4

1. 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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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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3. 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) $x^3 - x^2 - (2 + \sqrt{2})x + \sqrt{2}$

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4. 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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5. 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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