

Paper prepared by

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IX

MATHEMATICS WORKSHEET- POLYNOMIALS

Don't forget.....

- If $p(x)$ divided by $(x - a)$, then the remainder is $p(a)$.
- * If $p(x)$ divided by $(x + a)$, then the remainder is $p(-a)$.
- If $(x - a)$ is a factor of $p(x)$, then $p(a) = 0$.
- * If $(x + a)$ is a factor of $p(x)$, then $p(-a) = 0$
- If $p(a) = 0$, then $(x-a)$ is a factor.
- * if $p(-a) = 0$, then $(x + a)$ is a factor.
- If $(x - a)$ is a factor of $p(x)$, then $p(a) = 0$.
- * If $(x + a)$ is a factor of $p(x)$, then $p(-a) = 0$.
- If $(ax - b)$ is a factor of $p(x)$, then $p(b/a) = 0$.
- * If $(ax + b)$ is a factor of $p(x)$, then $p(-b/a) = 0$.
- $(x + y)^2 = x^2 + 2xy + y^2$.
- * $(x - y)^2 = x^2 - 2xy + y^2$.
- * $(x^2 - y^2) = (x + y)(x - y)$
- $(x + a)(x + b) = x^2 + (a + b)x + ab$.
- * $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$.
- $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$.
- * $(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$.
- $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$.
- * $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$.
- $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - xz)$
- If $x + y + z = 0$, then $x^3 + y^3 + z^3 = 3xyz$.

1. Find the remainder when $p(x) = 4x^3 - 12x^2 + 14x - 3$ when divided by $x - \frac{1}{2}$. (Use remainder theorem).
2. Find the remainder when $p(x) = x^3 - 6x^2 + 2x - 4$ when divided by $1 - 2x$. (Use remainder theorem).
3. If the polynomials $ax^3 + 3x^2 - 13$ and $2x^3 - 5x + a$, when divide by $(x-2)$ leave the same remainder.

4. Find the values of a and b so that the polynomial $x^3 - ax^2 - 13x + b$ has $(x-1)$ and $(x+3)$ as factors.
5. For what values of 'a' is $2x^3 + ax^2 + 11x + a + 3$ exactly divisible by $(2x-1)$.
6. If $ax^3 + bx^2 + x - 6$ has $(x+2)$ as a factor and leaves a remainder 4 when divided by $(x-2)$, find the values of a and b?
7. If (x^2-1) is a factor of $ax^4 + bx^3 + cx^2 + dx + c$, show that $a + c + e = b + d = 0$.
8. Using factor theorem factorize the following polynomials
 1) $x^4 + 2x^3 - 13x^2 - 14x + 24$. 2) $y^3 - 7y + 6$.
9. Find the remainder when $x^{51} + 51$ is divided by $(x+1)$.
10. For what value of 'm' $2x^3 + mx^2 + 11x + m + 3$ exactly divisible by $(x+1)$.
11. Find $p(0)$, $p(1)$ and $p(2)$ for each of the following polynomials.
 1). $p(x) = 4x^2 + x - 5$ 2). $p(y) = 9y^3 + 2y^2 + y + 7$
 3). $p(z) = (z+1)(z-1)$ 4) $p(t) = t^4 + t + 1$.
12. The polynomials $ax^3 + 3x - 3$ and $2x^3 - 5x + a$, when divided by $(x-4)$ leave the remainder R_1 and R_2 respectively. Find the value of 'a' if:
 1). $R_1 = R_2$ 2). $2R_1 - R_2 = 0$.
13. Divide the polynomial $x^3 - 27x^2 + 8x + 18$ by $(x-1)$ by long division method.
14. Factorize the following quadratic polynomials by splitting the middle term.
 1). $u^2 - 30u + 216$ 2). $7x^2 + 8x - 12$
 3). $3x^2 - 10x + 8$ 4). $2x^2 + 3x + 1$.
15. If $(x+1)$ is a factor of $x^3 + ax^2 - x + 3$, then find the value of 'a'.
16. Factorize: $(2x-3y)^3 + (3y-4z)^3 + (4z-2x)^3$.
17. If $a + b + c = 5$ and $ab + bc + ca = 10$, then prove that $a^3 + b^3 + c^3 - 3abc = -25$.
18. Prove that $(a+b+c)^3 - a^3 - b^3 - c^3 = 3(a+b)(b+c)(c+a)$.
19. If a, b, c are all non-zero and $a + b + c = 0$,
 prove that $\frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ba} = 3$

20. If $x + y + z = 9$ and $xy + yz + zx = 26$, find $x^2 + y^2 + z^2$?
21. Factorize: $(a^2 - 2a)^2 - 23(a^2 - 2a) + 120$.
22. If $p = 2 - a$, prove that $a^3 + 6ap + p^3 - 8 = 0$.
23. Factorize: $5(3x + y)^2 + 6(3x + y) - 8$.
24. Factorize: $a^3 - \frac{1}{a^3} - 2a + \frac{2}{a}$
25. Factorize: $\frac{x^2}{4} + \frac{4y^2}{9} + \frac{2xy}{3}$
26. Factorize: $2x^2 - \frac{5x}{6} + \frac{1}{12}$
27. Factorize: $x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x}$
28. Factorize: $x^2 + \left(\frac{a}{b} + \frac{b}{a}\right)x + 1$
29. Factorize: $a^3 - b^3 + 1 + 3ab$.
30. Find the product of $(2x+y)(2x-y)(4x^2+y^2)$.
31. If $a = 2$ and $b = 3$, then find the value of $\left(\frac{1}{a} + \frac{1}{b}\right)^2$
32. If $a^2 + b^2 + c^2 = 20$ and $a + b + c = 0$, find the value of $ab + bc + ca$.
33. If $x + y = 12$ and $xy = 32$, find the value $x^2 + y^2$.
34. Factorize: $(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$.
35. Factorize: $(a - 2b)^3 - 512b^3$.
36. If $p + q + r = 0$, then find the value of $\frac{p^2}{qr} + \frac{q^2}{pr} + \frac{r^2}{pq}$

37. Factorize: $p^3(q-r)^3+q^3(r-p)^3+r^3(p-q)^3$.
38. Factorize: $8(x + y)^3 - 27(x - y)^3$.
39. If $a + b + c = 9$ and $ab + bc + ca = 26$, find the value of $a^3 + b^3 + c^3 - 3abc$.
40. If $a + b + c = 9$ and $ab + bc + ca = 35$, find the value of $a^3 + b^3 + c^3 - 3abc$.
41. If $x+y+z=8$ and $xy+yz+xz=20$, find the value of $x^3+y^3+z^3-3xyz$.
42. Simplify: $\frac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$
43. Factorize: $(p - 3q)^3 + (3q - 7r)^3 + (7r - p)^3$.
44. Factorize: $(3x-5y)^3+(5y-9z)^3+(9z-3x)^3$.
45. Find the value of $60^3-45^3-15^3$.
46. Find the value of $(9.8)^3-(11.3)^3+(1.5)^3$.
47. Prove that: $a^3(b-c)^3+b^3(c-a)^3+c^3(a-b)^3 = 3abc(a-b)(b-c)(c-a)$.
48. Factorize the following:
1). $a^2b^2 - 23ab + 132$ 2). $a^4 - 5a^2b^2 + 4b^4$.
3). $8a^4 - 6a^2b^2 - 9b^4$ 4). $8a^2 - 2a^2b - 15ab^2$.
49. If $p + q + r = 1$, $pq + qr + rs = -1$ and $pqr = -1$, find the value of $p^3 + q^3 + r^3$.
50. Factorize the expression: $49x^2 + 81y^2 + 144z^2 + 126xy + 216yz + 168xz$.

51. Find the value of $(a^3 + 8b^3)$ if $a + 2b = 10$ and $ab = 15$.

52. Find the value of $(a^3 - 27b^3)$ if $a - 3b = -6$ and $ab = -10$.

53. Evaluate the following with suitable identity:

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|---------------|--------------|
| 1). 105^3 | 2). 999^3 |
| 3). $(9.8)^3$ | 4). 1001^3 |

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