

7.1 Adding and Subtracting Polynomials (pp. 357–364)Find $(2x^3 + 6x^2 - x) - (-3x^3 - 2x^2 - 9x)$.

$$\begin{aligned}(2x^3 + 6x^2 - x) - (-3x^3 - 2x^2 - 9x) &= (2x^3 + 6x^2 - x) + (3x^3 + 2x^2 + 9x) \\ &= (2x^3 + 3x^3) + (6x^2 + 2x^2) + (-x + 9x) \\ &= 5x^3 + 8x^2 + 8x\end{aligned}$$

Write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

1. $6 + 2x^2$ 2. $-3p^3 + 5p^6 - 4$ 3. $9x^7 - 6x^2 + 13x^5$ 4. $-12y + 8y^3$

Find the sum or difference.

5. $(3a + 7) + (a - 1)$ 6. $(x^2 + 6x - 5) + (2x^2 + 15)$
7. $(-y^2 + y + 2) - (y^2 - 5y - 2)$ 8. $(p + 7) - (6p^2 + 13p)$

7.2 Multiplying Polynomials (pp. 365–370)Find $(x + 7)(x - 9)$.

$$\begin{aligned}(x + 7)(x - 9) &= x(x - 9) + 7(x - 9) && \text{Distribute } (x - 9) \text{ to each term of } (x + 7). \\ &= x(x) + x(-9) + 7(x) + 7(-9) && \text{Distributive Property} \\ &= x^2 + (-9x) + 7x + (-63) && \text{Multiply.} \\ &= x^2 - 2x - 63 && \text{Combine like terms.}\end{aligned}$$

Find the product.

9. $(x + 6)(x - 4)$ 10. $(y - 5)(3y + 8)$ 11. $(x + 4)(x^2 + 7x)$ 12. $(-3y + 1)(4y^2 - y - 7)$

7.3 Special Products of Polynomials (pp. 371–376)

Find each product.

a. $(6x + 4y)^2$

$$\begin{aligned}(6x + 4y)^2 &= (6x)^2 + 2(6x)(4y) + (4y)^2 && \text{Square of a binomial pattern} \\ &= 36x^2 + 48xy + 16y^2 && \text{Simplify.}\end{aligned}$$

b. $(2x + 3y)(2x - 3y)$

$$\begin{aligned}(2x + 3y)(2x - 3y) &= (2x)^2 - (3y)^2 && \text{Sum and difference pattern} \\ &= 4x^2 - 9y^2 && \text{Simplify.}\end{aligned}$$

Find the product.

13. $(x + 9)(x - 9)$ 14. $(2y + 4)(2y - 4)$ 15. $(p + 4)^2$ 16. $(-1 + 2d)^2$

7.4 Solving Polynomial Equations in Factored Form (pp. 377–382)

Solve $(x + 6)(x - 8) = 0$.

$$(x + 6)(x - 8) = 0$$

$$x + 6 = 0 \quad \text{or} \quad x - 8 = 0$$

$$x = -6 \quad \text{or} \quad x = 8$$

Write equation.

Zero-Product Property

Solve for x .

Solve the equation.

17. $x^2 + 5x = 0$ 18. $(z + 3)(z - 7) = 0$ 19. $(b + 13)^2 = 0$ 20. $2y(y - 9)(y + 4) = 0$

7.5 Factoring $x^2 + bx + c$ (pp. 385–390)

Factor $x^2 + 6x - 27$.

Notice that $b = 6$ and $c = -27$. Because c is negative, the factors p and q must have different signs so that pq is negative.

Find two integer factors of -27 whose sum is 6.

Factors of -27	$-27, 1$	$-1, 27$	$-9, 3$	$-3, 9$
Sum of factors	-26	26	-6	6

The values of p and q are -3 and 9 .

► So, $x^2 + 6x - 27 = (x - 3)(x + 9)$.

Factor the polynomial.

21. $p^2 + 2p - 35$ 22. $b^2 + 18b + 80$ 23. $z^2 - 4z - 21$ 24. $x^2 - 11x + 28$

7.6 Factoring $ax^2 + bx + c$ (pp. 391–396)

Factor $5x^2 + 36x + 7$.

There is no GCF, so you need to consider the possible factors of a and c . Because b and c are both positive, the factors of c must be positive. Use a table to organize information about the factors of a and c .

Factors of 5	Factors of 7	Possible factorization	Middle term	
1, 5	1, 7	$(x + 1)(5x + 7)$	$7x + 5x = 12x$	✗
1, 5	7, 1	$(x + 7)(5x + 1)$	$x + 35x = 36x$	✓

► So, $5x^2 + 36x + 7 = (x + 7)(5x + 1)$.

Factor the polynomial.

25. $3t^2 + 16t - 12$ 26. $-5y^2 - 22y - 8$ 27. $6x^2 + 17x + 7$
 28. $-2y^2 + 7y - 6$ 29. $3z^2 + 26z - 9$ 30. $10a^2 - 13a - 3$

7.7 Factoring Special Products (pp. 397–402)

Factor each polynomial.

a. $x^2 - 16$

$$\begin{aligned}x^2 - 16 &= x^2 - 4^2 \\ &= (x + 4)(x - 4)\end{aligned}$$

Write as $a^2 - b^2$.

Difference of two squares pattern

b. $25x^2 - 30x + 9$

$$\begin{aligned}25x^2 - 30x + 9 &= (5x)^2 - 2(5x)(3) + 3^2 \\ &= (5x - 3)^2\end{aligned}$$

Write as $a^2 - 2ab + b^2$.

Perfect square trinomial pattern

Factor the polynomial.

31. $x^2 - 9$

32. $y^2 - 100$

33. $z^2 - 6z + 9$

34. $m^2 + 16m + 64$

7.8 Factoring Polynomials Completely (pp. 403–408)

Factor each polynomial completely.

a. $x^3 + 4x^2 - 3x - 12$

$$\begin{aligned}x^3 + 4x^2 - 3x - 12 &= (x^3 + 4x^2) + (-3x - 12) \\ &= x^2(x + 4) + (-3)(x + 4) \\ &= (x + 4)(x^2 - 3)\end{aligned}$$

Group terms with common factors.

Factor out GCF of each pair of terms.

Factor out $(x + 4)$.

b. $2x^4 - 8x^2$

$$\begin{aligned}2x^4 - 8x^2 &= 2x^2(x^2 - 4) \\ &= 2x^2(x^2 - 2^2) \\ &= 2x^2(x + 2)(x - 2)\end{aligned}$$

Factor out $2x^2$.

Write as $a^2 - b^2$.

Difference of two squares pattern

c. $2x^3 + 18x^2 - 72x$

$$\begin{aligned}2x^3 + 18x^2 - 72x &= 2x(x^2 + 9x - 36) \\ &= 2x(x + 12)(x - 3)\end{aligned}$$

Factor out $2x$.

Factor $x^2 + 9x - 36$.

Factor the polynomial completely.

35. $n^3 - 9n$

36. $x^2 - 3x + 4ax - 12a$

37. $2x^4 + 2x^3 - 20x^2$

Solve the equation.

38. $3x^3 - 9x^2 - 54x = 0$

39. $16x^2 - 36 = 0$

40. $z^3 + 3z^2 - 25z - 75 = 0$

41. A box in the shape of a rectangular prism has a volume of 96 cubic feet. The box has a length of $(x + 8)$ feet, a width of x feet, and a height of $(x - 2)$ feet. Find the dimensions of the box.