Algebra Formulas Cheat Sheet

Complete algebra formulas cheat sheet with exponent rules, factoring patterns, quadratic formula, logarithm rules, and polynomial identities. Free PDF download.

Exponent Rules

Product Rule

$$a^m \cdot a^n = a^{m+n}$$

Same base: add exponents

Quotient Rule

$$\frac{a^m}{a^n} = a^{m-n}$$

Same base: subtract exponents

Power Rule

$$(a^m)^n = a^{mn}$$

Power of a power: multiply

Product to Power

$$(ab)^n = a^n b^n$$

Quotient to Power

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

Zero Exponent

$$a^0 = 1 \quad (a \neq 0)$$

Negative Exponent

$$a^{-n} = \frac{1}{a^n}$$

Fractional Exponent

$$a^{m/n} = \sqrt[n]{a^m}$$

Factoring Patterns

Difference of Squares

$$a^2 - b^2 = (a + b)(a - b)$$

Perfect Square (sum)

$$a^2 + 2ab + b^2 = (a + b)^2$$

Perfect Square (diff)

$$a^2 - 2ab + b^2 = (a - b)^2$$

Sum of Cubes

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

Difference of Cubes

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Quadratic Equations

Standard Form

$$ax^2 + bx + c = 0$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

$$D = b^2 - 4ac$$

D > 0: two real roots D = 0: one root D < 0: complex roots

Vertex Form

$$y = a(x - h)^2 + k$$

Vertex at (h, k)

Sum of Roots

$$r_1 + r_2 = -\frac{b}{a}$$

Product of Roots

$$r_1 \cdot r_2 = \frac{c}{a}$$

Logarithm Rules

Definition

$$\log_a(x) = y \Leftrightarrow a^y = x$$

Product Rule

$$\log_a(xy) = \log_a(x) + \log_a(y)$$

Quotient Rule

$$\log_a\left(\frac{x}{y}\right) = \log_a(x) - \log_a(y)$$

Power Rule

$$\log_a(x^n) = n\log_a(x)$$

Change of Base

$$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$$

Log of 1

$$\log_a(1) = 0$$

Log of Base

$$\log_a(a) = 1$$

Radical Rules

Product

$$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

Quotient

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Power

$$\sqrt[n]{a^m} = a^{m/n}$$

Nested

$$\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$$

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