GENERAL

list of algebra 2 formulas

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Introduction

Algebra /2 is the bridge between the foundational algebraic concepts you learned in earlier grades and the more advanced topics that follow in calculus and beyond. Whether you're a high school student preparing for college, a teacher looking for a quick reference, or an adult learner brushing up on math skills, having a **list of algebra /2 formulas** at your fingertips can make complex problems feel more manageable.

This article compiles the essential algebra 2 formulas, organized into clear categories so you can locate the exact tool you need for any given problem. Along the way, we'll provide practical tips, common pitfalls, and real world applications that illustrate why each formula matters.

Let's dive into the heart of algebra 2 and build a solid, ready to use toolbox of formulas that will serve you for years to come.

Quadratic Equations and Functions

1. The Quadratic Formula

The quadratic formula solves any equation of the form $ax^2 + bx + c = 0$. It is the most frequently used algebra 2 formula.

- Formula: x = [-b ± " (b² - 4ac)] / (2a)
- Discriminant (9B“ 9B Ò +" Ò F 0
- Interpretation:

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- If 9B Ò Â F†R W V F–öâ † 2 öæR &V Â &ö÷B † &W V FVB &ö÷B'à
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2. Vertex Form of a Quadratic

Rewriting a quadratic function in vertex form makes it easy to identify the vertex and axis of symmetry.

- Standard form: $f(x) = ax^2 + bx + c$
- Vertex form: $f(x) = a(x - h)^2 + k$
- Conversion (completing the square):

h = -b / (2a)

- k = c - (b² / (4a))

3. Factoring Quadratics

Factoring is a quick way to solve quadratic equations when integer solutions exist.

- Common patterns:

(x + p)(x + q) = x² + (p + q)x + pq

- (x - p)(x - q) = x² - (p + q)x + pq

- Perfect square: $(x \pm p)^2 = x^2 \pm 2px + p^2$
- Difference of squares: $a^2 - b^2 = (a + b)(a - b)$

4. Sum and Product of Roots

For a quadratic equation $ax^2 + bx + c = 0$ with roots r • and r ,, the following relationships hold:

- Sum of roots: r • + r , = -b / a
- Product of roots: r • · r , = c / a

These formulas are handy when solving problems that involve relationships between roots without computing them explicitly.

Polynomial Functions

1. Polynomial Long Division

Long division is used to divide a polynomial by another polynomial, yielding a quotient and a remainder.

- General form: (Dividend) ÷ (Divisor) = Quotient + Remainder / Divisor
- Key steps:

  Align terms by decreasing degree.
- Divide the leading term of the dividend by the leading term of the divisor.
- Multiply the divisor by the result and subtract from the dividend.
- Repeat until the degree of the remainder is less than the degree of the divisor.

2. Synthetic Division

Synthetic division is a shortcut for dividing a polynomial by a linear factor of the form (x - c).

- Setup: Write the coefficients of the dividend polynomial in descending order. Place c to the left.
- Procedure:

  Bring down the leading coefficient.
- Multiply it by c and add to the next coefficient.
- Continue until you reach the last coefficient, which becomes the remainder.

3. Rational Root Theorem

The theorem helps identify possible rational roots of a polynomial equation.

- Statement: If p/q (in lowest terms) is a rational root of the polynomial a ™x • + a ™ ‹ •x • {¹ + … + a € = 0, then p divides a and q divides a ™.
- Procedure:

  List all factors of the constant term a € (possible numerators).
- List all factors of the leading coefficient a ™ (possible denominators).
- Test each fraction ±p/q in the polynomial.

Rational Functions

1. Simplifying Rational Expressions

To simplify a rational expression, factor both numerator and denominator, then cancel common factors.

- Example: (x² - 4) / (x² - 2x) factors to (x + 2)(x - 2) / x(x - 2), which simplifies to (x + 2) / x (for x "` 0).
- Key point: Always state the domain restrictions after simplification.

2. Asymptotes of Rational Functions

Vertical and horizontal asymptotes help describe the behavior of rational functions.

- Vertical asymptote: Occurs where the denominator equals zero and the numerator is non zero.
- Horizontal asymptote: Depends on the degrees of the numerator (m) and denominator (n):

  If m , the asymptote is y = 0.
- If m = n, the asymptote is y = (leading coefficient of numerator)/(leading coefficient of denominator).
- If m > n, no horizontal asymptote; there may be an oblique asymptote.

3. Domain of Rational Functions

The domain excludes values that make the denominator zero.

- Procedure: Solve denominator = 0 and exclude those roots from the domain.
- Example: For f(x) = 1/(x - 3), the domain is all real numbers except x = 3.

Exponential and Logarithmic Functions

1. Exponential Growth and Decay

Exponential functions model situations where quantities grow or shrink by a constant percentage.

- General form: y = a·b.2Â v†W&R " â æB " & à
- Growth: b > 1.
- Decay: 0 .
- Half life formula (decay): T½ = ln(0.5) / ln(b).
- Doubling time (growth): Tdoubling = ln(2) / ln(b).

2. Logarithmic Properties

Logarithms are the inverses of exponential functions. Mastering their properties simplifies many algebraic manipulations.

- Product rule: log_b(M·N) = log_b(M) + log_b(N)
- Quotient rule: log_b(M/N) = log_b(M) - log_b(N)
- Power rule: log_b(M •) = n·log_b(M)
- Change of base formula: log_b(a) = ln(a) / ln(b) = log_c(a) / log_c(b)
- Inverse property: b^{log_b(a)} = a and log_b(b^x) = x.

3. Solving Exponential Equations

To solve equations like a·b.2 Ò 0, use logarithms.

- Procedure:

  Divide both sides by a to isolate the exponential term.
- Take the logarithm of both sides: log_b(c/a) = x.

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