

College Algebra Formula Cheat Sheet

Algebra

$$1. (a + b)^2 = a^2 + 2ab + b^2$$

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

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

$$4. ax^2 + bx + c =$$

$$a \left(x - \frac{-b + \sqrt{b^2 - 4ac}}{2a} \right) \left(x - \frac{-b - \sqrt{b^2 - 4ac}}{2a} \right),$$

$$\text{if } b^2 - 4ac \geq 0$$

Trigonometry

Definitions

$$1. \tan x = \frac{\sin x}{\cos x}$$

$$2. \cot x = \frac{\cos x}{\sin x}$$

$$3. \sec x = \frac{1}{\cos x}$$

$$4. \csc x = \frac{1}{\sin x}$$

Identities

$$1. \cos^2 x + \sin^2 x = 1$$

$$2. \sin 2x = 2 \sin x \cos x$$

$$\begin{aligned} 3. \cos 2x &= \cos^2 x - \sin^2 x \\ &= 2 \cos^2 x - 1 \\ &= 1 - 2 \sin^2 x \end{aligned}$$

$$4. \tan^2 x + 1 = \sec^2 x$$

$$5. \cot^2 x + 1 = \csc^2 x$$

$$6. \tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$

$$7. \cot 2x = \frac{\cot^2 x - 1}{2 \cot x}$$

Derivatives

$$1. (\sin x)' = \cos x$$

$$2. (\cos x)' = -\sin x$$

$$3. (\tan x)' = \sec^2 x$$

$$4. (\cot x)' = -\csc^2 x$$

$$5. (\sec x)' = \tan x \sec x$$

$$6. (\csc x)' = -\cot x \csc x$$

$$7. (\arcsin x)' = \frac{1}{\sqrt{1-x^2}}$$

$$8. (\arccos x)' = \frac{-1}{\sqrt{1-x^2}}$$

$$9. (\arctan x)' = \frac{1}{1+x^2}$$

Integrals

$$1. \int \cos x \, dx = \sin x$$

$$2. \int \sin x \, dx = -\cos x$$

$$3. \int \sec^2 x \, dx = \tan x$$

$$4. \int \csc^2 x \, dx = -\cot x$$

$$5. \int \cot x \, dx = \ln |\sin x|$$

$$6. \int \tan x \, dx = -\ln |\cos x|$$

$$7. \int \sec x \, dx = \ln |\tan x + \sec x|$$

$$8. \int \csc x \, dx =$$

$$= -\ln |\cot x + \csc x|$$

Hyperbolic functions

Definitions

$$1. \sinh x = \frac{e^x - e^{-x}}{2}$$

$$3. \operatorname{csch} x = \frac{1}{\sinh x}$$

$$5. \tanh x = \frac{\sinh x}{\cosh x}$$

$$2. \cosh x = \frac{e^x + e^{-x}}{2}$$

$$4. \operatorname{sech} x = \frac{1}{\cosh x}$$

$$6. \coth x = \frac{\cosh x}{\sinh x}$$

Identities

$$1. \cosh^2 x - \sinh^2 x = 1$$

$$2. 1 - \tanh^2 x = \operatorname{sech}^2 x$$

$$3. \coth^2 x - 1 = \operatorname{csch}^2 x$$

$$4. \sinh 2x = 2 \sinh x \cosh x$$

$$\begin{aligned} 5. \cosh 2x &= \cosh^2 x + \sinh^2 x \\ &= 2 \cosh^2 x - 1 \\ &= 2 \sinh^2 x + 1 \end{aligned}$$

Derivatives

$$1. (\sinh x)' = \cosh x$$

$$2. (\cosh x)' = \sinh x$$

$$3. (\tanh x)' = \operatorname{sech}^2 x$$

$$4. (\coth x)' = -\operatorname{csch}^2 x$$

$$5. (\operatorname{sech} x)' = -\tanh x \operatorname{sech} x$$

$$6. (\operatorname{csch} x)' = -\coth x \operatorname{csch} x$$

$$7. (\operatorname{arcsinh} x)' = \frac{1}{\sqrt{x^2 + 1}}$$

$$8. (\operatorname{arcosh} x)' = \frac{1}{\sqrt{x^2 - 1}}$$

$$9. (\operatorname{artanh} x)' = \frac{1}{x^2 - 1}$$

College algebra formula cheat sheet is an invaluable resource for students navigating the foundational concepts of algebra. This guide serves as a comprehensive reference, summarizing key formulas, definitions, and strategies that will aid in solving various algebraic problems. Whether you are preparing for an exam or need a quick refresher while working on homework, this cheat sheet will help you grasp the essential elements of college algebra.

1. Fundamental Algebraic Concepts

Understanding the basic principles of algebra is crucial for success in college algebra. Here are some fundamental concepts you should master:

1.1 Variables and Constants

- Variable: A symbol (usually a letter) that represents an unknown quantity (e.g., x , y).
- Constant: A fixed value that does not change (e.g., 5, -3.14).

1.2 Expressions and Equations

- Expression: A combination of variables, constants, and operators (e.g., $3x + 5$).
- Equation: A statement that two expressions are equal, typically containing an equals sign (e.g., $2x + 3 = 7$).

1.3 Order of Operations

To simplify expressions and solve equations, remember the order of operations, often abbreviated as PEMDAS:

1. Parentheses
2. Exponents
3. Multiplication and Division (from left to right)
4. Addition and Subtraction (from left to right)

2. Linear Equations

Linear equations are foundational in algebra. They represent straight lines when graphed and can be expressed in various forms.

2.1 Standard Form

The standard form of a linear equation is given by:

$$Ax + By = C$$

Where:

- A , B , and C are constants.
- A and B cannot both be zero.

2.2 Slope-Intercept Form

The slope-intercept form is expressed as:

$$y = mx + b$$

Where:

- m is the slope of the line.
- b is the y-intercept (the point where the line crosses the y-axis).

2.3 Point-Slope Form

Point-slope form is useful for writing the equation of a line when you know one point and the slope:

$$y - y_1 = m(x - x_1)$$

Where:

- (x_1, y_1) is a point on the line.

3. Quadratic Equations

Quadratic equations are polynomial equations of degree two and can be represented as:

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

Where a , b , and c are constants.

3.1 Factoring Quadratics

Quadratics can often be factored into the form:

$$(px + q)(rx + s) = 0$$

To solve, set each factor equal to zero:

- $px + q = 0$
- $rx + s = 0$

3.2 Quadratic Formula

When factoring is not possible, use the quadratic formula:

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

Where:

- The term $(b^2 - 4ac)$ is called the discriminant and indicates the nature of the roots.

3.3 Completing the Square

Completing the square involves rewriting a quadratic equation in the form:

$$(x - p)^2 = q$$

To solve:

1. Isolate the (x^2) and (x) terms.
2. Add and subtract the square of half the coefficient of (x) .
3. Solve for (x) .

4. Functions and Graphs

Functions are vital in algebra, representing relationships between variables.

4.1 Definition of a Function

A function is a relation that assigns exactly one output for each input. If $f(x)$ represents a function, then:

- $f(a) = b$ indicates that a is mapped to b .

4.2 Types of Functions

- Linear Function: $f(x) = mx + b$
- Quadratic Function: $f(x) = ax^2 + bx + c$
- Exponential Function: $f(x) = a(b^x)$
- Logarithmic Function: $f(x) = \log_b(x)$

4.3 Graphing Functions

To graph functions:

1. Identify key features (intercepts, slope).
2. Create a table of values.
3. Plot points on a coordinate plane.
4. Connect points smoothly for curves.

5. Systems of Equations

Systems of equations involve solving for multiple variables simultaneously.

5.1 Solving Systems by Substitution

1. Solve one equation for one variable.
2. Substitute that expression into the other equation.
3. Solve for the remaining variable.

5.2 Solving Systems by Elimination

1. Align equations vertically.
2. Add or subtract equations to eliminate one variable.
3. Solve for the remaining variable.

5.3 Graphical Method

1. Graph both equations on the same coordinate plane.
2. Identify the point(s) of intersection, which are the solutions.

6. Exponents and Radicals

Understanding exponents and radicals is critical for manipulating algebraic expressions.

6.1 Laws of Exponents

1. $(x^a \cdot x^b = x^{a+b})$

2. $\left(\frac{x^a}{x^b} = x^{a-b} \right)$
3. $\left((x^a)^b = x^{ab} \right)$
4. $\left(x^{-a} = \frac{1}{x^a} \right)$

6.2 Simplifying Radicals

- To simplify $\left(\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b} \right)$.
- Rationalize denominators by multiplying by the conjugate.

7. Polynomials

Polynomials are expressions consisting of variables raised to whole number powers.

7.1 Polynomial Operations

1. Addition/Subtraction: Combine like terms.
2. Multiplication: Use the distributive property or FOIL for binomials.
3. Division: Use long division or synthetic division.

7.2 The Remainder and Factor Theorems

- Remainder Theorem: If a polynomial $\left(f(x) \right)$ is divided by $\left(x - c \right)$, the remainder is $\left(f(c) \right)$.
- Factor Theorem: $\left(x - c \right)$ is a factor of $\left(f(x) \right)$ if $\left(f(c) = 0 \right)$.

8. Additional Topics

8.1 Inequalities

Inequalities express a relationship where one side is greater or less than the other.

- Linear Inequality: $\left(ax + b < c \right)$
- Solving Inequalities: Similar to equations, but reverse the inequality sign when multiplying/dividing by a negative.

8.2 Absolute Value Equations

An absolute value equation is of the form:

$$|x| = a$$

Solutions are:

- $x = a$
- $x = -a$

8.3 Sequences and Series

- Arithmetic Sequence: A sequence with a common difference d .
- Geometric Sequence: A sequence with a common ratio r .

The sum of the first n terms of an arithmetic sequence can be calculated as:

$$S_n = \frac{n}{2} (a + l)$$

Where a is the first term, l is the last term.

Conclusion

The college algebra formula cheat sheet condenses essential algebraic concepts and formulas into a single, accessible guide. Mastery of these principles allows students to tackle complex problems with confidence, laying a strong foundation for advanced mathematical studies. Whether you're solving equations, working with functions, or grappling with polynomials, this cheat sheet will serve as a reliable companion throughout your college algebra journey. Consistent practice and application of these formulas will not only enhance your understanding but also boost your performance in exams and coursework.

Frequently Asked Questions

What is a college algebra formula cheat sheet?

A college algebra formula cheat sheet is a condensed reference guide that includes essential formulas, equations, and concepts commonly covered in college algebra courses, helping students quickly access information during study or exams.

What key formulas are typically included in a college algebra cheat sheet?

Key formulas often included are those for quadratic equations, exponential functions, logarithms, polynomial identities, factoring techniques, and systems of equations.

How can a cheat sheet help students in college algebra?

A cheat sheet can aid students by providing quick access to important formulas and concepts, reducing the time spent searching for information, and enhancing recall during tests and problem-solving.

Are there any specific tips for creating an effective college algebra cheat sheet?

Yes, tips include organizing formulas by topic, using clear headings, incorporating examples, highlighting key concepts, and keeping it concise to facilitate quick review.

Can I use a college algebra cheat sheet during exams?

This depends on the exam's rules; some instructors allow formula sheets, while others do not. Always check the exam guidelines before using one.

Where can I find reliable college algebra formula cheat sheets?

Reliable cheat sheets can be found in textbooks, online educational resources, university websites, or student-generated content on study platforms like Quizlet or Course Hero.

Is it beneficial to memorize formulas instead of using a cheat sheet?

While memorization can be beneficial for understanding and quick recall, using a cheat sheet can enhance accuracy and confidence, especially under exam pressure. A combination of both is often ideal.

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