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The Most Comprehensive Review of Algebra I

By

Reza Nazari

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All inquiries should be addressed to:
info@EffortlessMath.com
www.EffortlessMath.com

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function it defines.
b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
c. Use the properties of exponents to transform expressions for exponential functions.

APR. A Perform arithmetic operations on polynomials.

A – APR. 1 Understand that polynomials form a system analogous to the integers, namely, they are closed under certain operations.

a. Perform operations on polynomial expressions (addition, subtraction, multiplication), and compare the system of polynomials to the system of integers when performing operations.
b. Factor and/or expand polynomial expressions, identify and combine like terms, and apply the Distributive Property.

A – CED. A Create equations that describe numbers or relationships.

A – CED. 1 Create equations and inequalities in one variable and use them to solve problems. (Include equations arising from linear, quadratic, and exponential functions with integer exponents.)

A – CED. 2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A – CED. 3 Represent constraints by linear equations or inequalities, and by systems of linear equations and/or inequalities and interpret solutions as viable or non-viable options in a modeling context.

A – CED. 4 Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations (Properties of equality).

A – REI. A Understand solving equations as a process of reasoning and explain the reasoning.

A – REI. 1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify or refute a solution method.

A – REI. B Solve equations and inequalities in one variable.

A – REI. 3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

a. Solve linear equations and inequalities in one variable involving absolute value.

A – REI. 4 Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the

quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g. for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the solutions of a quadratic equation results in non-real solutions and write them as $a \pm bi$ for real numbers a and b.

A − REI. C Solve systems of equations.

A − REI. 5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A − REI. 6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A − REI. 7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

A − REI. D Represent and solve equations and inequalities graphically.

A − REI. 10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Show that any point on the graph of an equation in two variables is a solution to the equation.

A − REI. 11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions and make tables of values. Include cases where $f(x)$ and/or $g(x)$ are linear and exponential functions.

$A - REI$. 12 Graph the solutions of a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set of a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

F − IF. A Understand the concept of a function and use function notation.

F − IF. 1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and *x* is an element of its domain, then $f(x)$ denotes the output (range) of f corresponding to the input *x*. The graph of f is the graph of the equation $y = f(x)$.

F – IF. 2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F – IF. 3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

F – IF. B Interpret linear, quadratic, and exponential functions with integer exponents that arise in applications in terms of the context.

F – IF. 4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.

F – IF. 5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F – IF. 6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F – IF. C Analyze functions using different representations.

F – IF. 7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
b. Graph piecewise-defined functions, including step functions and absolute value functions.
c. Graph exponential functions showing intercepts and end behavior.

F – IF. 8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, maximum/minimum values, and symmetry of the graph, and interpret these in terms of a context.
b. Use the properties of exponents to interpret expressions for exponential functions.

F – IF. 9 Translate among different representations of functions (algebraically, graphically, numerically in tables, or by verbal descriptions). Compare properties of two functions each represented in a different way.

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