South Dakota Mathematics

Algebra II

Expressions

Radical Expressions and Rational Exponents

1. Apply the properties of exponents to translate between radical and exponential forms of expressions. A2.E.1
2. Simplify and perform operations with radical expressions with and without variables; rationalizing denominators should include conjugates. A2.E.2

Complex Number

3. Understand an imaginary number to be a product of any real number and the imaginary unit i where i^2 = −1. A2.E.3
4. Understand a complex number to be a number of the form a + bi where aa and b are real numbers and i is the imaginary unit. A2.E.4
5. Add, subtract, multiply, and divide complex numbers. A2.E.5

Algebraic Functions

Compositions

1. Compose functions and evaluate their composition A2.AF.1

Graph and Key Features

2. Graph rational functions, identifying zeros and asymptotes (vertical and horizontal) when suitable factorizations are available and showing end behavior, with or without the appropriate technology. A2.AF.2
3. Compare properties of graphs, tables, equations, and verbal descriptions of two functions. A2.AF.3
4. Calculate and interpret the average rate of change of a function, both symbolically and from a table over a specified interval. Estimate the rate of change from a graph. A2.AF.4

Transformations

5. Given a graph, explain the effects of the transformation from the parent function including square root and cubic functions, rational, and absolute value functions. A2.AF.5
6. Describe the transformation of functions in the coordinate plane including translation, reflection, and dilation. A2.AF.6

Inverses

7. Explain how restricting the domain of a function allows for the creation of its inverse. A2.AF.7
8. rite and graph the inverse of a given function; understand that the graph of an inverse function is a reflection of the function over the line $y = x$. A2.AF.8
9. Verify if two functions are inverses of each other using composition of functions A2.AF.9
10. Using ordered pairs, determine the inverse of a function given a graph or table A2.AF.10

Linear Functions, Equations and Inequalities

Arithmetic Sequences

1. Write and use arithmetic sequences recursively and explicitly to model situations; translate between the two forms when given a graph, a description of the relationship, or two input-output pairs. A2.LF.1

Matrices

2. Multiply a matrix by a scalar A2.LF.2
3. Add and subtract matrices. A2.LF.3

Systems of Equations

4. Solve systems of linear equations in three variables A2.LF.4
5. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A2.LF.5

Quadratic Functions, Equations, and Inequalities

Create and Solve

1. Select, justify and apply appropriate methods to solve quadratic equations in one variable. Recognize complex solutions and write them as a +/- bi for real numbers a and b. A2.QF.1
2. Represent and solve real-world problems using quadratic equations and inequalities. A2.QF.2

Graph and Key Features

3. Use the discriminant to determine the number and type of solutions of a quadratic equation. A2.QF.3
4. Sketch the graph of a quadratic function given a verbal description and show key features. A2.QF.4

System of Equations

5. Solve a system of equations consisting of a linear equation and a nonlinear equation in two variables algebraically or graphically with or without technology. A2.QF.5

Exponential and Logarithmic Functions and Equations

Create and Solve

1. Use the properties of exponents to find equivalent expressions and to solve equations, including those involving rational exponents. A2.EL.1
2. Interpret the solution of a logarithmic equation as reasonable or unreasonable in context. A2.EL.2

Logarithms

3. Translate between logarithmic and exponential forms of an equation. A2.EL.3
4. Use properties of logarithms to simplify and evaluate logarithmic expressions, with or without technology. A2.EL.4
5. Use the inverse relationship between exponents and logarithms to solve problems. A2.EL.5

Graph and Key Features

6. Graph logarithmic functions, showing intercepts and end behavior. A2.EL.6

Trigonometric Functions and Equations

Create and Solve

1. Select trigonometric functions that model real-world contexts. A2.TF.1
2. Develop the Pythagorean identity, sin^2(θ) + cos^2(θ) = 1. A2.TF.2
3. Apply the Pythagorean identity to find the remaining trigonometric functions when given sin (θ), cos (θ), or tan (θ) and the quadrant of the angle. A2.TF.3

Graphs and Key Features

4. Explain how changes in amplitude, period, and midline affect the graph of sine and cosine functions, using transformations and real-world contexts to support understanding. A2.TF.4

Unit Circle

5. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. A2.TF.5
6. Explain how the unit circle can be used to model sine, cosine, tangent, secant, cosecant, and cotangent for all real numbers A2.TF.6

Polynomial, Rational, and Other Functions and Equations

Create and Solve

1. Construct a possible polynomial given a graph. A2.PR.1
2. Create equations and inequalities with one variable and use them to solve problems, including absolute value functions A2.PR.2
3. Solve formulas for a specific variable. A2.PR.3
4. Solve rational and radical equations containing one variable specifying extraneous solutions. A2.PR.4

Graph and Key Features

5. Explain how the multiplicity of zeros affects the shape of a polynomial graph, using reasoning and visual patterns to justify the behavior at each intercept. A2.PR.5
6. Interpret the key features of polynomial functions that model a relationship between two quantities in a given context; translate between different representations of the function, especially graphs, tables, and equations. A2.PR.6
7. Determine the domain and range of polynomial and rational functions. A2.PR.7
8. Graph polynomial functions, identifying zeros when suitable factorizations are available and showing end behavior, with or without the appropriate technology. A2.PR.8

Factor Polynomials

9. Apply the remainder and factor theorems to identify factors and find solutions to polynomial equations of degree greater than 2 and explain how each theorem supports the reasoning process. A2.PR.9
10. Factor polynomials using polynomial identities, including difference of squares, sum and difference of cubes, and the square of a sum or difference. A2.PR.10

Rational Expressions

11. Divide polynomial expressions using factorization, long division, and synthetic division, with and without a remainder. A2.PR.11

Systems of Equations

12. Explain why a solution to the equation $f(x) = g(x)$ is the x-coordinate where the y-coordinate of $f(x)$ and $g(x)$ are the same using graphs, tables, or approximations, include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, exponential, or rational and where at least one of the functions is not linear. A2.PR.12

Statistics and Probability

Statistical Experiments and Studies

1. Represent and use mathematical models for bivariate data sets to answer questions, draw conclusions, and make decisions. A2.SP.1
2. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate A2.SP.2
3. Distinguish between sample surveys, experiments, and observational studies and explain the purpose of randomization in statistical studies. A2.SP.3
4. Use data from a random sample to make inferences about a population. A2.SP.4
5. Compare theoretical and experimental probabilities using simulations. A2.SP.5
6. Read and explain, in context, the validity of data from outside reports by identifying the variables as quantitative or categorical and describing how the data was collected. A2.SP.6
7. Indicate any potential biases or flaws and identifying inferences the author of the report made from sample data. A2.SP.7