Texas Tutorials are designed specifically for the Texas Essential Knowledge and Skills (TEKS) to prepare students for the State of Texas Assessment of Academic Readiness (STAAR)® end-of-course assessments.

State of Texas Assessment of Academic Readiness® and STAAR® are registered trademarks of the Texas Education Agency.

Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

1. SYSTEMS OF EQUATIONS AND INEQUALITIES

- **SOLVING SYSTEMS OF LINEAR EQUATIONS: MATRICES**
  - **3.A** *formulate systems of equations, including systems consisting of three linear equations in three variables and systems consisting of two equations, the first linear and the second quadratic;*
  - **3.B** *solve systems of three linear equations in three variables by using Gaussian elimination, technology with matrices, and substitution;*
  - **1.B** *use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*

- **SOLVING SYSTEMS OF LINEAR INEQUALITIES**
  - **1.B** *use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;*
  - **3.E** *formulate systems of at least two linear inequalities in two variables;*
  - **3.F** *solve systems of two or more linear inequalities in two variables; and*
  - **3.G** *determine possible solutions in the solution set of systems of two or more linear inequalities in two variables.*

2. ADVANCED SYSTEMS OF EQUATIONS

- **SOLVING THREE-VARIABLE SYSTEMS OF LINEAR EQUATIONS**
  - **1.B** *use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;*
  - **3.A** *formulate systems of equations, including systems consisting of three linear equations in three variables and systems consisting of two equations, the first linear and the second quadratic;*
  - **3.B** *solve systems of three linear equations in three variables by using Gaussian elimination, technology with matrices, and substitution;*

- **SYSTEMS OF NONLINEAR EQUATIONS**

- 1.C *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
- 3.A *formulate systems of equations, including systems consisting of three linear equations in three variables and systems consisting of two equations, the first linear and the second quadratic;*
- 3.C *solve, algebraically, systems of two equations in two variables consisting of a linear equation and a quadratic equation;*
- 3.D *determine the reasonableness of solutions to systems of a linear equation and a quadratic equation in two variables;*

3. FUNCTIONS

- ### DOMAIN AND RANGE

  - 1.G *display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.*
  - 7.I *write the domain and range of a function in interval notation, inequalities, and set notation.*
  - 1.F *analyze mathematical relationships to connect and communicate mathematical ideas; and*

- ### ABSOLUTE VALUE FUNCTIONS

  - 7.I *write the domain and range of a function in interval notation, inequalities, and set notation.*
  - 6.D *formulate absolute value linear equations;*
  - 6.E *solve absolute value linear equations;*
  - 2.A *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log_b(x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - 6.C *analyze the effect on the graphs of $f(x) = |x|$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d;*

4. SCATTERPLOTS, MODELING, AND INVERSE FUNCTIONS

- ### SCATTERPLOTS AND MODELING

  - 1.E *create and use representations to organize, record, and communicate mathematical ideas;*
  - 8.B *use regression methods available through technology to write a linear function, a quadratic function, and an exponential function from a given set of data; and*
  - 1.C *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
  - 1.D *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - 4.E *formulate quadratic and square root equations using technology given a table of data;*
  - 8.C *predict and make decisions and critical judgments from a given set of data using linear, quadratic, and exponential models.*
  - 8.A *analyze data to select the appropriate model from among linear, quadratic, and exponential models;*

- ### INVERSE FUNCTIONS

  - 2.B *graph and write the inverse of a function using notation such as $f^{-1}(x)$;*
  - 2.C *describe and analyze the relationship between a function and its inverse (quadratic and square root, logarithmic and exponential), including the restriction(s) on domain, which will restrict its range; and*
  - 1.E *create and use representations to organize, record, and communicate mathematical ideas;*

5. TRANSFORMING FUNCTIONS

- ### PARENT FUNCTIONS

  - 1.E *create and use representations to organize, record, and communicate mathematical ideas;*
  - 6.A *analyze the effect on the graphs of $f(x) = x^3$ and $f(x) = \sqrt[3]{x}$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $(x) + d$ for specific positive and negative real values of a, b, c, and d;*
  - 1.F *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - 7.I *write the domain and range of a function in interval notation, inequalities, and set notation.*

- **5.A** *determine the effects on the key attributes on the graphs of f(x) = b to the x power and f(x) = logb (x) where b is 2, 10, and e when f(x) is replaced by af(x), f(x) + d, and f(x - c) for specific positive and negative real values of a, c, and d;*
- **2.A** *graph the functions f(x)=√x, f(x)=1/x, f(x)=x³, f(x)= ³√x, f(x)=b to the x power, f(x)=|x|, and f(x)=logb (x) where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*

- **TRANSFORMATIONS OF PARENT FUNCTIONS**
  - **6.C** *analyze the effect on the graphs of f(x) = |x| when f(x) is replaced by af(x), f(bx), f(x - c), and f(x) + d for specific positive and negative real values of a, b, c, and d;*
  - **6.G** *analyze the effect on the graphs of f(x) = 1/x when f(x) is replaced by af(x), f(bx), f(x - c), and f(x) + d for specific positive and negative real values of a, b, c , and d;*
  - **4.C** *determine the effect on the graph of f(x) = √x when f(x) is replaced by af(x), f(x) + d, f(bx), and f(x - c) for specific positive and negative values of a, b, c, and d;*
  - **5.A** *determine the effects on the key attributes on the graphs of f(x) = b to the x power and f(x) = logb (x) where b is 2, 10, and e when f(x) is replaced by af(x), f(x) + d, and f(x - c) for specific positive and negative real values of a, c, and d;*
  - **6.A** *analyze the effect on the graphs of f(x) = x³ and f(x) = ³√x when f(x) is replaced by af(x), f(bx), f(x - c), and (x) + d for specific positive and negative real values of a, b, c, and d;*
  - **2.A** *graph the functions f(x)=√x, f(x)=1/x, f(x)=x³, f(x)= ³√x, f(x)=b to the x power, f(x)=|x|, and f(x)=logb (x) where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*

- **MULTIPLE TRANSFORMATIONS OF PARENT FUNCTIONS**
  - **1.C** *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
  - **1.E** *create and use representations to organize, record, and communicate mathematical ideas;*
  - **5.A** *determine the effects on the key attributes on the graphs of f(x) = b to the x power and f(x) = logb (x) where b is 2, 10, and e when f(x) is replaced by af(x), f(x) + d, and f(x - c) for specific positive and negative real values of a, c, and d;*
  - **6.C** *analyze the effect on the graphs of f(x) = |x| when f(x) is replaced by af(x), f(bx), f(x - c), and f(x) + d for specific positive and negative real values of a, b, c, and d;*
  - **6.G** *analyze the effect on the graphs of f(x) = 1/x when f(x) is replaced by af(x), f(bx), f(x - c), and f(x) + d for specific positive and negative real values of a, b, c , and d;*
  - **2.A** *graph the functions f(x)=√x, f(x)=1/x, f(x)=x³, f(x)= ³√x, f(x)=b to the x power, f(x)=|x|, and f(x)=logb (x) where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **4.C** *determine the effect on the graph of f(x) = √x when f(x) is replaced by af(x), f(x) + d, f(bx), and f(x - c) for specific positive and negative values of a, b, c, and d;*

6. POLYNOMIALS I

- **ADDITION AND SUBTRACTION OF POLYNOMIALS**
  - **1.C** *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
  - **7.B** *add, subtract, and multiply polynomials;*

- **MULTIPLICATION OF POLYNOMIALS**
  - **1.C** *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
  - **7.B** *add, subtract, and multiply polynomials;*

7. POLYNOMIALS II

- **DIVISION OF POLYNOMIALS**

- **1.C** *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
- **7.C** *determine the quotient of a polynomial of degree three and of degree four when divided by a polynomial of degree one and of degree two;*

- **GRAPHS OF POLYNOMIAL FUNCTIONS**

  - **6.A** *analyze the effect on the graphs of $f(x) = x^3$ and $f(x) = \sqrt[3]{x}$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $(x) + d$ for specific positive and negative real values of a, b, c, and d;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)= \sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log b\ (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*

8. QUADRATIC FUNCTIONS

- **REPRESENTATIONS OF QUADRATIC FUNCTIONS**

  - **4.D** *transform a quadratic function $f(x) = ax^2 + bx + c$ to the form $f(x) = a(x - h)^2 + k$ to identify the different attributes of $f(x)$;*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*
  - **4.E** *formulate quadratic and square root equations using technology given a table of data;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **4.F** *solve quadratic and square root equations;*

- **ANALYZING GRAPHS OF QUADRATIC FUNCTIONS**

  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*

- **PARABOLAS**

  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **1.C** *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*
  - **1.G** *display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*
  - **4.D** *transform a quadratic function $f(x) = ax^2 + bx + c$ to the form $f(x) = a(x - h)^2 + k$ to identify the different attributes of $f(x)$;*

9. SOLVING QUADRATIC EQUATIONS

- **SOLVING QUADRATIC EQUATIONS BY FACTORING**

  - **1.A** *apply mathematics to problems arising in everyday life, society, and the workplace;*
  - **4.F** *solve quadratic and square root equations;*
  - **4.A** *write the quadratic function given three specified points in the plane;*
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*

- **COMPLETING THE SQUARE**
  - **4.F** *solve quadratic and square root equations;*
  - **4.D** *transform a quadratic function f(x) = ax² + bx + c to the form f(x) = a(x - h)² + k to identify the different attributes of f(x);*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*

- **QUADRATIC FORMULA**
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **1.A** *apply mathematics to problems arising in everyday life, society, and the workplace;*
  - **4.F** *solve quadratic and square root equations;*
  - **1.G** *display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.*
  - **4.A** *write the quadratic function given three specified points in the plane;*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*

10. QUADRATIC EQUATIONS AND INEQUALITIES

- **COMPLEX NUMBERS AND QUADRATIC FUNCTIONS**
  - **4.F** *solve quadratic and square root equations;*
  - **7.A** *add, subtract, and multiply complex numbers;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **4.B** *write the equation of a parabola using given attributes, including vertex, focus, directrix, axis of symmetry, and direction of opening;*

- **SOLVING QUADRATIC INEQUALITIES**
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **1.E** *create and use representations to organize, record, and communicate mathematical ideas;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **4.H** *solve quadratic inequalities.*

11. FACTORING POLYNOMIALS

- **FACTORING CUBIC POLYNOMIALS**
  - **7.D** *determine the linear factors of a polynomial function of degree three and of degree four using algebraic methods;*
  - **7.E** *determine linear and quadratic factors of a polynomial expression of degree three and of degree four, including factoring the sum and difference of two cubes and factoring by grouping;*

- **FACTORING HIGHER-ORDER POLYNOMIALS**
  - **7.D** *determine the linear factors of a polynomial function of degree three and of degree four using algebraic methods;*
  - **7.E** *determine linear and quadratic factors of a polynomial expression of degree three and of degree four, including factoring the sum and difference of two cubes and factoring by grouping;*

12. SOLVING HIGHER-ORDER POLYNOMIAL EQUATIONS

- **FACTOR THEOREM AND REMAINDER THEOREM**
  - **7.D** *determine the linear factors of a polynomial function of degree three and of degree four using algebraic methods;*
  - **7.E** *determine linear and quadratic factors of a polynomial expression of degree three and of degree four, including factoring the sum and difference of two cubes and factoring by grouping;*

- **RATIONAL ROOT THEOREM**
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **7.D** *determine the linear factors of a polynomial function of degree three and of degree four using algebraic methods;*
  - **7.E** *determine linear and quadratic factors of a polynomial expression of degree three and of degree four, including factoring the sum and difference of two cubes and factoring by grouping;*

13. RATIONAL EXPRESSIONS, EQUATIONS, AND FUNCTIONS

- **OPERATIONS WITH RATIONAL EXPRESSIONS**
  - **7.F** *determine the sum, difference, product, and quotient of rational expressions with integral exponents of degree one and of degree two;*

- **SOLVING RATIONAL EQUATIONS**
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log_b (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **6.I** *solve rational equations that have real solutions;*
  - **6.J** *determine the reasonableness of a solution to a rational equation;*

14. RATIONAL FUNCTIONS

- **ANALYZING GRAPHS OF RATIONAL FUNCTIONS**
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log_b (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **6.G** *analyze the effect on the graphs of $f(x) = 1/x$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x - c)$, and $f(x) + d$ for specific positive and negative real values of a, b, c, and d;*
  - **6.K** *determine the asymptotic restrictions on the domain of a rational function and represent domain and range using interval notation, inequalities, and set notation; and*

- **MODELING SITUATIONS WITH RATIONAL FUNCTIONS**
  - **1.A** *apply mathematics to problems arising in everyday life, society, and the workplace;*
  - **6.H** *formulate rational equations that model real-world situations;*
  - **6.I** *solve rational equations that have real solutions;*
  - **6.J** *determine the reasonableness of a solution to a rational equation;*

- **MODELING SITUATIONS WITH DIRECT AND INVERSE VARIATION**
  - **1.B** *use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;*
  - **1.A** *apply mathematics to problems arising in everyday life, society, and the workplace;*
  - **6.L** *formulate and solve equations involving inverse variation.*
  - **6.H** *formulate rational equations that model real-world situations;*
  - **6.I** *solve rational equations that have real solutions;*
  - **6.J** *determine the reasonableness of a solution to a rational equation;*

15. RADICAL EXPRESSIONS, EQUATIONS, AND FUNCTIONS

- **ADVANCED PROPERTIES OF SQUARE ROOT EXPRESSIONS**
  - **7.G** *rewrite radical expressions that contain variables to equivalent forms;*
  - **1.G** *display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.*

- **SOLVING SQUARE ROOT EQUATIONS**
  - **4.F** *solve quadratic and square root equations;*
  - **4.G** *identify extraneous solutions of square root equations; and*
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log b\ (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **4.C** *determine the effect on the graph of $f(x) = \sqrt{x}$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(bx)$, and $f(x - c)$ for specific positive and negative values of a, b, c, and d;*

- **ANALYZING GRAPHS OF SQUARE ROOT FUNCTIONS**
  - **4.C** *determine the effect on the graph of $f(x) = \sqrt{x}$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(bx)$, and $f(x - c)$ for specific positive and negative values of a, b, c, and d;*
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log b\ (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **2.B** *graph and write the inverse of a function using notation such as $f^{-1}\ (x)$;*
  - **2.C** *describe and analyze the relationship between a function and its inverse (quadratic and square root, logarithmic and exponential), including the restriction(s) on domain, which will restrict its range; and*
  - **7.I** *write the domain and range of a function in interval notation, inequalities, and set notation.*

16. EXPONENTIAL FUNCTIONS AND EQUATIONS

- **EXPONENTIAL FUNCTIONS**
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log b\ (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*
  - **1.F** *analyze mathematical relationships to connect and communicate mathematical ideas; and*
  - **1.D** *communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;*
  - **1.B** *use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;*
  - **5.B** *formulate exponential and logarithmic equations that model real-world situations, including exponential relationships written in recursive notation;*
  - **5.D** *solve exponential equations of the form $y = ab$ to the x power where a is a nonzero real number and b is greater than zero and not equal to one and single logarithmic equations having real solutions; and*

- **SOLVING EXPONENTIAL EQUATIONS**
  - **2.C** *describe and analyze the relationship between a function and its inverse (quadratic and square root, logarithmic and exponential), including the restriction(s) on domain, which will restrict its range; and*
  - **5.C** *rewrite exponential equations as their corresponding logarithmic equations and logarithmic equations as their corresponding exponential equations;*
  - **5.D** *solve exponential equations of the form $y = ab$ to the x power where a is a nonzero real number and b is greater than zero and not equal to one and single logarithmic equations having real solutions; and*
  - **2.A** *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log b\ (x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*

17. LOGARITHMIC EXPRESSIONS, FUNCTIONS, AND EQUATIONS

- **LOGARITHMIC FUNCTIONS**
  - **2.B** *graph and write the inverse of a function using notation such as $f^{-1}\ (x)$;*
  - **2.C** *describe and analyze the relationship between a function and its inverse (quadratic and square root, logarithmic and exponential), including the restriction(s) on domain, which will restrict its range; and*

- 5.C *rewrite exponential equations as their corresponding logarithmic equations and logarithmic equations as their corresponding exponential equations;*
- 2.A *graph the functions $f(x)=\sqrt{x}$, $f(x)=1/x$, $f(x)=x^3$, $f(x)=\sqrt[3]{x}$, $f(x)=b$ to the x power, $f(x)=|x|$, and $f(x)=\log_b(x)$ where b is 2, 10, and e, and, when applicable, analyze the key attributes such as domain, range, intercepts, symmetries, asymptotic behavior, and maximum and minimum given an interval;*

- **EVALUATING LOGARITHMIC EXPRESSIONS**

  - 2.B *graph and write the inverse of a function using notation such as $f^{-1}(x)$;*
  - 1.C *select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;*

- **SOLVING LOGARITHMIC EQUATIONS**

  - 5.D *solve exponential equations of the form $y = ab$ to the x power where a is a nonzero real number and b is greater than zero and not equal to one and single logarithmic equations having real solutions; and*
  - 5.E *determine the reasonableness of a solution to a logarithmic equation.*