TN Department of Education

Integrated Math III

The purpose of this document is to provide teachers with guidance to help them connect the Tennessee mathematics standards with the performance levels of our statewide assessment. The document provides evidence of learning to help teachers determine how a student is progressing toward grade-level expectations. Additionally, instructional guidance is provided to clarify the types of instruction that will help a student progress along the continuum of learning.

Standards	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	Performance at this level demonstrates that the student has a minimal understanding and has a nominal ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.	Performance at this level demonstrates that the student is approaching understanding and has a partial ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.	Performance at this level demonstrates that the student has a comprehensive understanding and thorough ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.	Performance at this level demonstrates that the student has an extensive understanding and expert ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.
M3.G.MG.A.2 Apply geometric methods to solve real-world problems. **Scope and Clarification:** *Geometric methods may include but are not limited to using geometric shapes, the probability of a shaded*	**Students with a level 1 understanding of this standard will most likely be able to:** Choose which geometric attribute(s) need(s) to be calculated in order to solve a real-world geometric problem.	**Students with a level 2 understanding of this standard will most likely be able to:** Identify which geometric attribute(s) need(s) to be calculated in order to solve a real-world geometric problem.	**Students with a level 3 understanding of this standard will most likely be able to:** Apply geometric methods to solve real-world problems. **Instructional Focus:** Students are applying geometric concepts learned in previous	**Students with a level 4 understanding of this standard will most likely be able to:** Create a variety of real-world problems whose solutions require the application of geometric methods. **Instructional Focus:**

region, density, and design problems. *There are no assessment limits for this standard. The entire standard is assessed in this course.* *Note: This is a major work of the grade standard.* *Note: This is a modeling standard*	Solve mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms when a visual representation is provided. Solve mathematical problems involving volume of cones, cylinders, and spheres when a visual representation is provided.	Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Solve real-world and mathematical problems involving surface area of cones, cylinders, and spheres.	grades in order to solve real-world geometric application problems. Students should have familiarity with not only how to calculate area, volume, and surface area, but also the hallmark attributes of each.	Students should be formulating a strategy to solve the problem based on a mathematical understanding of the situation, computing solutions, interpreting findings, and validating their thinking and the reasonableness of attained solutions in order to justify solutions to real-world geometric problems, with increased rigor over the course.
M3.A.SSE.A.1 Use the structure of an expression to identify ways to rewrite it. **Scope and Clarifications:** *For example, see* $2x^4 + 3x^2 - 5$ *as its factors* $(x^2 - 1)$ *and* $(2x^2 + 5)$*; see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*,*	**Students with a level 1 understanding of this standard will most likely be able to:** Choose a polynomial, rational, or exponential expression that is equivalent to a given expression.	**Students with a level 2 understanding of this standard will most likely be able to:** Rewrite polynomial, rational, and exponential expressions into a given form.	**Students with a level 3 understanding of this standard will most likely be able to:** Rewrite polynomial, rational, and exponential expressions into a different form and explain why rewriting	**Students with a level 4 understanding of this standard will most likely be able to:** Generate multiple forms of a single polynomial, rational, or exponential expression and explain in both verbal and written

thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$*; see* $(x^2 + 4)/(x^2 + 3)$ *as* $((x^2 + 3) + 1)/(x^2 + 3)$*, thus recognizing an opportunity to write it as* $1 + 1/(x^2 + 3)$*.* *Tasks are limited to polynomial, rational, or exponential expressions.* *Note: This is a major work of the grade standard.*			the expression in that form is beneficial. **Instructional Focus:** Seeing structure in expressions involves critically examining an algebraic expression in which potential rearrangements and manipulations are present. An important skill for college readiness is the ability to try possible manipulations mentally without having to carry them out, and to see which ones might be fruitful and which might not. Students should be able to provide a mathematical justification for when different forms of expressions are more beneficial.	form the mathematics that was employed to transform the expression. Additionally, explain which form is most useful and provide mathematical justification. **Instructional Focus:** Students need to be challenged to write polynomial, rational, and exponential expressions in multiple forms where the initial expressions increase in difficulty over time. The hallmark of this standard is students being able to communicate the importance and benefit gained from writing expressions in various forms. Students should be able to express what the individual terms within the expression mean

			As polynomials overlap integrated math II and integrated math III, the focus for integrated III needs to be placed on non-quadratic polynomials. Much of the ability to see and use structure in transforming expressions comes from learning to fluently recognize certain fundamental algebraic situations.	and how they relate to terms in the other various representations of the same expression.
M3.A.SSE.B.2 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **M3.A.SSE.B.2a** Use the properties of exponents to rewrite exponential expressions.	**Students with a level 1 understanding of this standard will most likely be able to:** Recognize an exponential expression. Recognize properties of exponents. Without context, choose an equivalent	**Students with a level 2 understanding of this standard will most likely be able to:** From a real-world context, choose an equivalent form of an exponential expression and choose the properties used to transform the expression.	**Students with a level 3 understanding of this standard will most likely be able to:** From a real-world context generate an equivalent form of an exponential expression and identify the properties of exponents used to generate the expression.	**Students with a level 4 understanding of this standard will most likely be able to:** From a real-world context, generate equivalent forms of an exponential expression, justify each transformation with a property, and explain the benefits of the equivalent expression.

Scope and Clarifications: *For example, the expression 1.15^t can be rewritten as $((1.15)^{1/12})^{12t} \approx 1.012^{12t}$ to reveal that the approximate equivalent monthly interest rate is 1.2% if the annual rate is 15%.* *i) Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation.* *ii) Tasks are limited to exponential expressions with rational or real exponents.*	form of an exponential expression.		**Instructional Focus:** The introduction of rational exponents and practice with the properties of exponents in high school further widens the field of operations students will be manipulating. In integrated math III, focus should be placed on exponential expressions with rational or real exponents, furthering the real word contexts that can be used as a backbone for this modeling standard. As this is a modeling standard, it is important to emphasize that the exponential expressions should be embedded in real-world situations. This provides a context for seeing structure in the expression and allows	**Instructional Focus:** Students should continue to demonstrate an understanding of seeing structure in expressions by not only being able to rewrite exponential expressions in various forms, but also in both mathematically justifying the steps to reach the desired rewritten form and describing when and why the rewritten form would be beneficial. Students should encounter exponential expressions of increasing difficulty in increasingly more complex real-world situational problems.

Note: This is a major work of the grade standard. *Note: This is a modeling standard*			students to see when and why it is beneficial to view them in different forms. Additionally, it's important to note that the focus is not on writing expressions in simplest form as there really is no simplest form. The form that expressions are written in should be driven by what is being done with the expression in the first place.	
M2.A.APR.A.1 Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. **Scope and Clarifications:**	**Students with a level 1 understanding of this standard will most likely be able to:** Define factor.	**Students with a level 2 understanding of this standard will most likely be able to:** Choose the remainder when a polynomial $p(x)$ is divided by $x - a$. Determine if a given number a is a possible factor for a polynomial $p(x)$.	**Students with a level 3 understanding of this standard will most likely be able to:** For a polynomial $p(x)$ and a number a, determine if $x - a$ is a factor of $p(x)$. Identify the remainder when a polynomial $p(x)$ is divided by $x - a$.	**Students with a level 4 understanding of this standard will most likely be able to:** Find all factors for a polynomial $p(x)$. Explain the Remainder Theorem using appropriate mathematical vocabulary in both

There are no assessment limits for this standard. The entire standard is assessed in this course. *Note: This is a major work of the grade standard.*			Identify all possible factors of a polynomial *p(x)*. **Instructional focus:** A particularly important application of polynomial division is the case where a polynomial *p(x)* is divided by a linear factor of the form $x - a$, for a real number *a*. In this case, the remainder is a value *p(a)* of the polynomial at $x = a$. It is important that this topic not be reduced to simply "synthetic division," which reduces the method to a matter of carrying numbers between registers, something easily done by a computer, and prevents students from developing conceptual understanding of the Remainder Theorem. It	verbal and written form. **Instructional focus:** Students with a deep conceptual understanding of the Remainder Theorem can explain the equivalence between linear factors and zeros. This is the basis of much work with polynomials in high school: the fact that $p(a)=0$ if and only if $x - a$ is a factor of *p(x)*. They can deduce that if $x - a$ is a factor then $p(a)=0$. But the Remainder Theorem tells us that $p(x)=(x - a)\,q(x) + p(a)$ for some polynomial *q(x)*. In particular, if $p(a)=0$ then $p(x)=(x-a)\,q(x)$, so $x - a$ is a factor of *p(x)*.

			is important for students to see the Remainder Theorem as a theorem, not a technique.	
M3.A.APR.A.2 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **Scope and Clarifications:** *Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of* $(x^2 - 1)(x^2 + 1)$. *Note: This is a major work of the grade standard.*	**Students with a level 1 understanding of this standard will most likely be able to:** Factor a quadratic polynomial with a lead coefficient of 1. Choose the zeros for a given quadratic polynomial with a lead coefficient of 1. Choose a graph to represent a given quadratic polynomial in factored form.	**Students with a level 2 understanding of this standard will most likely be able to:** Factor a quadratic polynomial with a lead coefficient of 1, identify the zeros, and construct a rough graph of the function defined by the polynomial. Explain the mathematical term zero using appropriate mathematical vocabulary in both verbal and written form. Choose a graph to represent a given	**Students with a level 3 understanding of this standard will most likely be able to:** Factor a quadratic, cubic, or quartic polynomial, identify the zeros, and construct a rough graph of the function defined by the polynomial. Generate a rough graph to represent a given non-quadratic polynomial function presented in factored form. **Instructional Focus:** Polynomial functions are, on the one hand, very elementary, in	**Students with a level 4 understanding of this standard will most likely be able to:** Explain the process for generating a rough sketch of any factorable polynomial function using accurate mathematical vocabulary in both written and verbal form. **Instructional Focus:** At this level of understanding, students should be demonstrating strong understanding of the relationship that exists between an algebraic representation that

		polynomial presented in factored form. Generate a rough graph to represent a given quadratic polynomial presented in factored form.	that they are built up out of the basic operations of arithmetic. On the other hand, they turn out to be amazingly flexible and can be used to approximate more advanced functions such as trigonometric and exponential functions in later courses. Experience with constructing polynomial functions satisfying given conditions is useful preparation not only for calculus, but for understanding the mathematics behind curve-fitting methods used in applications to statistics and computer graphics. The first step in developing this understanding is to construct a rough	elicits zeros of a polynomial function and the graphical representation of zeros, moving fluidly between the two. Additionally, they should be able to provide a mathematical explanation of the relationship between algebraic and graphical representations of zeros.

			graph for polynomial functions by using their zeros. Eventually, this progression will lead to constructing polynomial functions whose graphs pass through any specified set of points in the plane. It is important that students in this early stage continue to develop an understanding of the connection that exists between the graphical and algebraic representation of zeros and that they are not simply following a rote procedure but provide evidence of an understanding of this connection. In integrated math III, students are focusing on quadratic, cubic,	

			and quartic polynomials when factors are not provided. Quadratic polynomials were also a focus for integrated math II. Thus in integrated math III, when quadratics are the focus, they should be of appropriate difficulty.	
M3.A.APR.B.3 Know and use polynomial identities to describe numerical relationships. **Scope and Clarifications:** *For example, compare (31)(29) = (30 + 1) (30 – 1) = 302 – 12 with* $(x + y)(x - y) = x^2 - y^2$. *There are no assessment limits for this standard. The entire standard is assessed in this course.*	**Students with a level 1 understanding of this standard will most likely be able to:** Match polynomial identities with numerical relationships that are examples of the polynomial identity.	**Students with a level 2 understanding of this standard will most likely be able to:** Given a polynomial identity, use it to describe a given numerical relationship.	**Students with a level 3 understanding of this standard will most likely be able to:** Identify an appropriate polynomial identity and use it to describe a given numerical relationship. **Instructional Focus:** Polynomials form a rich ground for mathematical explorations that reveal relationships in the system of integers.	**Students with a level 4 understanding of this standard will most likely be able to:** Identify an appropriate polynomial identity, use it to describe a given numerical relationship, and explain the benefit of using that particular polynomial identity to describe the numerical relationship. **Instructional Focus:**

			Instruction should be focused on looking at a wide variety of numerical relationships that are intentionally connected to a polynomial identity. Instruction should not focus simply on the rewriting of numerical relationships, but instead on why it is beneficial to do so.	As students master this standard, they show the most conceptual understanding when they are able to explain the benefit of rewriting numerical relationships in multiple ways. Students should experience numerical relationships that can be rewritten using polynomial identities with increasing variance and difficulty over time.
M3.A.APR.C.4 Rewrite rational expressions in different forms. **Scope and Clarifications:** *There are no assessment limits for this standard. The entire standard is assessed in this course.*	**Students with a level 1 understanding of this standard will most likely be able to:** Rewrite a polynomial division expression as rational expression and vice versa.	**Students with a level 2 understanding of this standard will most likely be able to:** Given a rational expression, choose equivalent forms to represent the expression.	**Students with a level 3 understanding of this standard will most likely be able to:** Rewrite rational expressions involving addition, subtraction, multiplication, and/or division in different forms. **Instructional Focus:** This standard serves a dual purpose. First, it	**Students with a level 4 understanding of this standard will most likely be able to:** Explain the mathematical relationship that exists between the Remainder Theorem and rewriting rational expressions with a polynomial numerator and a first degree binomial denominator.

			provides the opportunity for students to interact with long division, which is similar to integer long division. When connected to standard M3.A.APR.A.1, it helps support students developing an understanding of the Remainder Theorem. Second, it offers students the opportunity to connect operations on rational numbers to operations with rational expressions. Particular attention should be paid to this connection as opposed to a rote series of steps without any conceptual understanding.	Rewrite complicated rational expressions involving addition, subtraction, multiplication and/or division in different forms. **Instructional Focus:** The focus of instruction should emphasize the discovery of the connections that exist between the Remainder Theorem and rational division so that students can explain the relationship. Additionally, they should encounter and work with simplifying rational expressions involving all operations with increased rigor over time.

M3.A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. **Scope and Clarification:** *i)Tasks are limited to polynomial, rational, absolute value, exponential, or logarithmic functions.* *ii)Tasks have a real-world context.* *Note: This is a major work of the grade standard.* *Note: This is a modeling standard.*	**Students with a level 1 understanding of this standard will most likely be able to:** Identify if a real-world situation can be represented by a polynomial, rational, absolute value, exponential, or logarithmic equation. Determine if the solution to a real-world situation requires a one-variable or two-variable equation or inequality. Solve a simple one-variable polynomial (quadratic) equation or inequality. Solve a simple one-variable exponential equation or inequality.	**Students with a level 2 understanding of this standard will most likely be able to:** Solve a one variable rational equation or inequality. Solve a one-variable polynomial equation or inequality. Solve a one-variable absolute value equation or inequality. Solve a one-variable logarithmic equation or inequality. Choose a polynomial, absolute value, or logarithmic equation to represent a simple, real-world situation. Choose a polynomial, absolute value, or logarithmic inequality	**Students with a level 3 understanding of this standard will most likely be able to:** Create and solve a one-variable polynomial, absolute value, or logarithmic equation that represents a real-world situation. Create and solve a one-variable polynomial, absolute value, or logarithmic inequality that represents a real-world situation. **Instructional Focus:** In integrated math III, the variety of function types that students encounter allow students to create even more complex equations and work within more complex situations than what has been previously experienced.	**Students with a level 4 understanding of this standard will most likely be able to:** Create a real-world situational problem to represent a given polynomial, rational, absolute value, exponential, or logarithmic equation or inequality. **Instructional Focus:** When given an equation or inequality, students can generate a real-world situation that could be solved by a provided equation or inequality demonstrating a deep understanding of the interplay that exists between the situation and the equation or inequality used to solve the problem.

	Solve a simple one-variable rational equation or inequality. Choose a simple polynomial (quadratic), rational or exponential equation to represent a simple, real-world situation. Choose a simple polynomial (quadratic), exponential, or rational inequality to represent a simple, real-world situation.	to represent a simple, real-world situation. Create and solve a one-variable simple polynomial (quadratic), rational, or exponential equation that represents a real-world situation.	As this is a modeling standard, students need to encounter equations and inequalities that evolve from real-world situations. Students should be formulating equations and inequalities, computing solutions, interpreting findings, and validating their thinking and the reasonableness of attained solutions in order to justify solutions to real-world problems. Real-world situations should elicit equations and inequalities from situations which are polynomial, absolute value, rational, exponential and logarithmic in nature. As quadratic and simple exponential functions are a focus in previous courses, it is	Additionally, students should continue to encounter real-world problems that are increasingly more complex. Students should be using the modeling cycle to solve real-world problems.

			imperative that students have the opportunity to work with polynomials with degree greater than 2, rational, logarithmic, and complex exponential equations and inequalities in integrated math III.	
M3.A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales. **Scope and Clarifications:** *There are no assessment limits for this standard. The entire standard is assessed in this course.* *Note: This is a major work of the grade standard.*	**Students with a level 1 understanding of this standard will most likely be able to:** Create and graph a two variable linear equation that represents a real-world or mathematical situation. Choose a quadratic, square root, cube root, or simple piecewise equation to represent a real-world or mathematical situation. Choose a quadratic, square root, cube root,	**Students with a level 2 understanding of this standard will most likely be able to:** Create and graph a quadratic, square root, cube root, or simple piecewise equation to represent a real-world or mathematical situation. Choose an equation to represent a real-world or mathematical situation for a wide variety of function types including non-linear, non-quadratic polynomial, absolute	**Students with a level 3 understanding of this standard will most likely be able to:** Create and graph a two-variable equation that represents a real-world or mathematical situation for a wide variety of function types including non-linear, non-quadratic polynomial, absolute value, exponential, logarithmic, step, and more complex piecewise functions. **Instructional Focus:**	**Students with a level 4 understanding of this standard will most likely be able to:** Create a real-world situational problem to represent a given equation for a wide variety of function types including non-linear, non-quadratic polynomial, absolute value, exponential, logarithmic, step, and more complex piecewise functions. Create and graph a two-variable equation that represents a complex

Note: This is a modeling standard.	or piecewise graph to represent a real-world or mathematical situation. Determine if the solution to a real-world or mathematical situation requires a one-variable or two variable equation.	value, exponential, logarithmic, step, and more complex piecewise functions. Choose a graph to represent a real-world or mathematical situation for a wide variety of function types including non-linear, non-quadratic polynomial, absolute value, exponential, logarithmic, step, and more complex piecewise functions.	In integrated math III, students should continue to build their understanding of how real-world and mathematical situations can elicit a wide variety of equations and graphs. Students should encounter real-world problems that are increasingly more complex over time. They should be creating more complex equations and working within more complex situations than what had been previously experienced. As this is a modeling standard, it is important for students to encounter equations that evolve from both mathematical and real-world situations. Students should be formulating equations,	real-world or mathematical situation for a wide variety of function types including non-linear, non-quadratic polynomial, absolute value, exponential, logarithmic, step, and more complex piecewise functions. **Instructional Focus:** One of the most natural situations for students to create an equation or graph from is a real-world situation. Students need to be exposed to variety of real-world situations that illicit the wide variety of function types embedded within the integrated math III course. They should be using the modeling cycle in order to develop and provide justification for their solutions.

			computing solutions, interpreting findings, and validating their thinking and the reasonableness of attained solutions in order to justify solutions to mathematical and real-world problems. The problems encountered should elicit equations from situations which represent a wide variety of function types including non-linear, non-quadratic polynomial, absolute value, exponential, logarithmic, step, and more complex piecewise functions. It is imperative that students be exposed to creating and graphing each of these function types equally.	Additionally, students should be posed with an equation and then asked to generate a real-world situation that could be solved by a provided equation. Students with this capability are demonstrating a deep understanding of the interplay that exists between the situation and the equation used to solve the problem.

M3.A.CED.A.3 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **Scope and Clarifications:** *i) Tasks have a real-world context.* *ii) Tasks are limited to polynomial, rational, absolute value, exponential, or logarithmic functions.* *Note: This is a major work of the grade standard.* *Note: This is a modeling standard.*	**Students with a level 1 understanding of this standard will most likely be able to:** Choose equivalent forms of a given linear or quadratic real-world formula.	**Students with a level 2 understanding of this standard will most likely be able to:** Rearrange real-world quadratic formulas to highlight a quantity of interest. Choose equivalent forms of a given non-linear, non-quadratic real-world formula. Choose equivalent forms of a given rational real-world formula. Choose equivalent forms of a given absolute value real-world formula. Choose equivalent forms of a given exponential real-world formula.	**Students with a level 3 understanding of this standard will most likely be able to:** Rearrange real-world non-linear, non-quadratic polynomial formulas to highlight a quantity of interest. Rearrange real-world rational formulas to highlight a quantity of interest. Rearrange real-world absolute value formulas to highlight a quantity of interest. Rearrange real-world exponential formulas to highlight a quantity of interest. Rearrange real-world logarithmic formulas to highlight a quantity of interest.	**Students with a level 4 understanding of this standard will most likely be able to:** Rearrange real-world non-linear, non-quadratic polynomial, rational, absolute value, exponential, or logarithmic formulas and explain the benefit of solving the formula for the various variables. **Instructional Focus:** Students need to be exposed to a wide variety of real-world formulas increasing in complexity over time. Additionally, it is imperative that they are able to explain why formulas might need to be expressed in different ways and the benefit that each form provides.

		Choose equivalent forms of a given logarithmic real-world formula.	**Instructional Focus:** In previous grades and courses, students have focused on rearranging linear, quadratic, square root and cube root formulas to highlight a quantity of interest. In integrated math III, students should be working with non-linear, non-quadratic polynomial, rational, absolute value, exponential, or logarithmic formulas. As this is a modeling standard, student should be encountering formulas that come from real-world situations. Additionally, students need to be deepening their conceptual understanding of why they might need to write formulas in different ways and what the benefit would be to these various	

			representations of the same real-world formula.	
M3.A.REI.B.3 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 approximate solutions using technology. **Scope and Clarifications:** *Tasks may include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, or logarithmic functions.* *Note: This is a major work of the grade standard.* *Note: This is a modeling standard.*	**Students with a level 1 understanding of this standard will most likely be able to:** Given two linear equations *f(x)* and *g(x)*, identify the solution of the equation *f(x)=g(x).*	**Students with a level 2 understanding of this standard will most likely be able to:** Given two equations *f(x)* and *g(x)* embedded in a real-world situation, approximate the solution(s) for *f(x)=g(x)* using technology when *f(x)* and *g(x)* are absolute value functions. Given graphs of 2 equations *f(x) and g(x)*, identify the solution(s) for *f(x)=g(x)* when *f(x)* and *g(x)* are polynomial, rational, exponential, or logarithmic functions	**Students with a level 3 understanding of this standard will most likely be able to:** Given two equations *f(x)* and *g(x)* embedded in a real-world situation, approximate the solution(s) for *f(x)=g(x)* using technology when *f(x)* and *g(x)* are polynomial, rational, exponential, or logarithmic functions. 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).* **Instructional Focus:** In continuing to develop an	**Students with a level 4 understanding of this standard will most likely be able to:** 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)* and explain the meaning of the solution in terms of a real-world context. **Instructional Focus:** Students should continue to be exposed to a wide variety of linear, polynomial, rational, absolute value, exponential, or logarithmic functions with increasing difficulty embedded in real-world situations.

			understanding of what it means to find the solution to two equations using graphing, it is very important that just as we did not want algebraically solving equations to become a series of steps unsupported by reasoning, we want to make sure that graphically solving them the reasoning piece is not left out either. The simple idea that an equation can be solved (approximately) by graphing can often lead to a rote series of steps involving simply finding the intersection point(s) without employing the reasoning of what is actually occurring. Explaining why the *x*-coordinates of the points where the	Additionally, they need to explain the meaning of the solution in terms of the real-world context.

			graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ involves a rather sophisticated series of thinking as students must connect the idea of two equations in two variables and how that relates to a single equation in one variable and then understand how both connect to a point(s) on a coordinate plane which is built around two variables. Thus, it is imperative that students reason through this process without being given a truncated set of meaningless steps to follow. As this is a modeling standard, students should be formulating equations, computing	

			solutions, interpreting findings, and validating their thinking and the reasonableness of attained solutions in order to justify solutions built out of real-world situations. In integrated math III, students are focusing on linear, polynomial, rational, absolute value, exponential, or logarithmic functions. It is important to note that students have already worked on developing an understanding of this standard with linear and absolute value functions in previous courses. Students need the opportunity to interact with all of these function types. Additionally, they need to encounter situations where *f(x)* and *g(x)* are different function	

			types. These should increase in difficulty over time.	