Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Algebra	**Grade Level: Algebra 2**
A2.A.REI.C Cluster: Represent and Solve Equations and Inequalities Graphically *This cluster has learners recognize that they can rewrite an equation as multiple functions in order to determine solution(s). Learners are also able to read a graph and/or table in order to determine solutions to systems.*	
****This is a MAJOR cluster.** *Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.* **A2.A.REI.C.11 (ii) 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, including but not limited to using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.** ***(Uses Modeling)***	
Aspects of Rigor for Students: (Conceptual, Procedural, and/or Application)	
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Conceptual Understanding	***Procedural Fluency***	***Application***
Learners will understand what a solution of a system means on a graph or table. Students will also be able to write an equation as two separate functions that they can solve graphically or with tables Example: The equation $2^x = x^2 + 2x$ can be rewritten as the two equations $y = 2^x$and $y = x^2 + 2x$ and then graphed to determine the points of intersection (see example 3 below in **Relevance, Explanation, and Example**). Students also know when solving graphically/with a table is more efficient than solving algebraically. Students understand what an	Learners will be able to solve systems using a graph and a table as well as rewrite an equation as two functions (and vice versa).	Relate this knowledge to real world situations. Example: Determine when the cost of two cars that are depreciating in value are the same.

approximate solution looks like when reading a table.		

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   - Students are able to write an equation as two separate functions that they can use to solve (by solving the system).
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
   - Students will be able to explain in their own words how and when a solution is given as a point (x, y) vs. a value (x = a value).
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

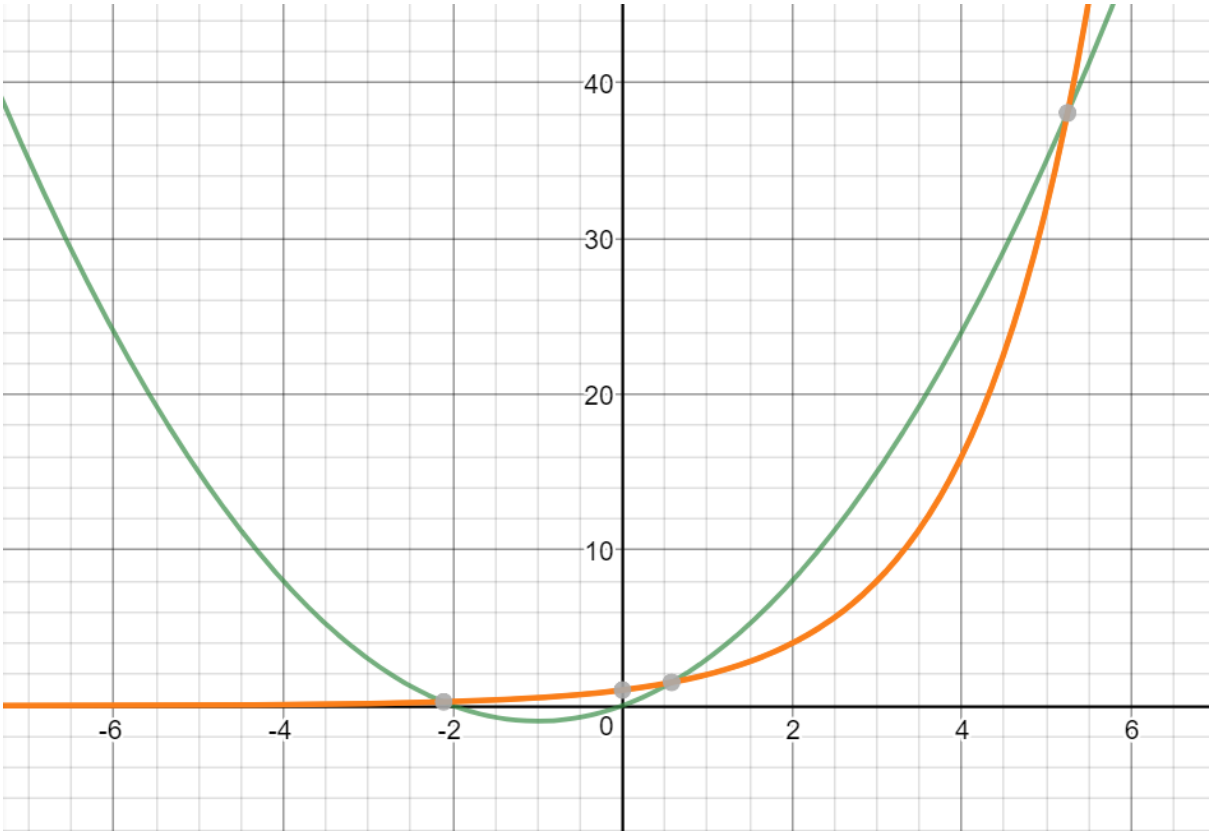
Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In Algebra 1, students learn how to solve linear systems and equations and quadratic equations through the use of tables and graphs.	*This cluster transcends through the entire course, since it is discussed with every new function presented.*	*In future math course, students will use this cluster in order to determine specific solutions to new functions (i.e. zeros). Also in Calculus, when students discuss the area between two curves and volume with rotation.*

Vocabulary (key terms and definitions)

Relevance, Explanations, and Examples:

A system can include equations such as:
Ex 1: $y = 3x^2 + 4x - 7$and $y = 0$ solutions: (-2.33, 0) (1, 0)
Ex 2: $y = 8x^2 - x - 1$and $y = 5x^2 - 3x + 2$ solutions: (0.721, 2.44) (-1.387, 15.787)

Example 3: $2^x = x^2 + 2x$ solutions: x = -2.11, x = 0.579 and x=5.251
Equation is rewritten as the two equations $y = 2^x$and $y = x^2 + 2x$ and then graphed below to find the points of
intersection. Note the solutions are only the x values of the points of intersection due to the form of the original equation.



Achievement Level Descriptors	
Cluster: Represent and Solve Equations and Inequalities Graphically	
Concepts and Procedures	***Level 1:*** Students should be able to represent a linear equation with an integer-valued slope in two variables graphically on a coordinate plane.
	Level 2: Students should be able to represent linear equations and inequalities and quadratic equations with integer coefficients in one and two variables graphically on a coordinate plane and should understand that the plotted line or curve represents the solution set to an equation. They should be able to graph and estimate the solution of systems of linear equations.
	Level 3: Students should be able to represent polynomial, rational, absolute value, exponential, and logarithmic functions graphically. They should be able to graph and estimate the solution of systems of equations and systems of linear inequalities. They should understand that the plotted line, curve, or region represents the solution set to an equation or inequality.
	Level 4: Students should be able to explain why the x-coordinates of the points where f(x) and g(x) intersect compose the solution to f(x) = g(x).