Rational Relationships

7.1/7.2 Develop and solve rational expressions and equations

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Operations with rational expressions (A.APR.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Add, subtract, multiply and divide rational expressions, **using multiple operations,** simplifying the expression **and** identifying any restricted values	Add, subtract, multiply **and** divide rational expressions, simplifying the expression **or** identifying any restricted values	Add, subtract, multiply **or** divide rational expressions **(Can perform 2 of the 4),** simplifying the expression **or** identifying any restricted values	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Solve rational equations (A.REI.2)		Solve a rational equation **involving factoring** and identify extraneous solutions	Solve a rational equation **and identify extraneous solutions**	Solve a rational equation **that is a proportion.**	
Rewrite polynomial expressions (A.SSE.2)		Rewrite polynomial expressions in different equivalent forms by using **all of the following:** ● greatest common factors ● difference of two squares ● trinomials ● quadratic-like trinomials (degree 4 or higher) ● sums or difference of cubes	Rewrite polynomial, rational, and exponential expressions in different equivalent forms by doing **4 of the following**: ● greatest common factors ● difference of two squares ● trinomials ● quadratic-like trinomials (degree 4 or higher) ● sums or difference of cubes	Rewrite polynomial, rational, and exponential expressions in different equivalent forms by doing **3 of the following**: ● greatest common factors ● difference of two squares ● trinomials ● quadratic-like trinomials (degree 4 or higher) ● sums or difference of cubes	

A.APR.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.SSE.2 Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.

Rational Relationships

8.1/8.2 Represent and compare rational functions

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Graph and identify key features of rational functions (F.IF.5, F.IF.7d)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Graph rational functions, given the model, and interpret all related key features of a graph **in context of a real world situation**. ● zeros ● asymptotes ● intercepts ● holes ● end behavior ● domain	**Graph** rational functions, given the model, and identify all related key features of a graph. ● zeros ● asymptotes ● intercepts ● holes ● end behavior ● domain	**Given the graphs** of rational, exponential, logarithmic and trigonometric functions, and identify all related key features of a graph. ● zeros ● asymptotes ● intercepts ● holes ● end behavior ● domain	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Explain intersec-tion points (A.REI.11)		For rational functions find intersection points using technology, graphs, and tables and **explain in the context of a situation**	For rational functions find intersection points using technology, graphs, **and** tables	For rational functions find intersection points using technology, graphs **or** tables	

F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★

F.IF.7d Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases
d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

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, 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.*