Mathematics
Curriculum Document for Algebra 2

Unit Title: Rational Functions and Expressions	**Time Frame: 14 blocks**
Grading Period: 3	**Unit Number: 7**

Curriculum

Enduring Understandings (Big Ideas):

- Understanding how a parameter change affects the whole helps us make predictions.
- Solutions need to be evaluated for reasonableness.

The student will know:

- Rational functions are quotients of polynomials
- Vertical asymptotes occur when the denominator is zero
- Horizontal asymptotes occur as the graph approaches *d*
- Extraneous solutions may exist in rational equations
- *af(x)* is a vertical stretch/compression
- *f(bx)* is a horizontal stretch/compression
- *f(x-c)* is horizontal shift
- *f(x) + d* is a vertical shift
- *-f(x)* is a reflection
- Domain includes the set of all x-values
- Range includes the set of all y-values

The student will be able to:

- write the domain and range of rational functions in interval notation $(-\infty,3)\cup(3,\infty)$
- write the domain and range of rational functions in inequalities $x<3 \; and \; x>3$
- write the domain and range of rational functions in set notation {y l y $\varepsilon \Re \neq 3$ }
- Model and make predictions using inverse variation
- graph rational functions, $f(x) = \frac{1}{x}$

	• analyze the key attributes of rational functions, such as domain, range, intercepts, and asymptotes • analyze the transformations of rational functions ($f(x) = \frac{1}{x}$ when $f(x)$ is replaced by $af(x)$, $f(bx)$, $f(x-c)$, and $f(x) + d$) • formulate rational equations that model real-world situations • solve rational equations that have real solutions and determine the reasonableness of the solution • determine the asymptotic restrictions on the domain and range • formulate and solve equations involving inverse variation • add, subtract, multiply, and divide rational functions of degree one and two • find common denominators of rational functions

Essential Questions:

- What is a solution and what does it represent?
- How is the whole picture affected when one aspect is altered?
- Why is it important to analyze effects of changing parameters?

Student Understanding (Student Friendly TEKS):
Content:

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- I can graph rational functions. (taken from 2A.2A)
- I can describe domain, range, and asymptotic behavior of rational functions. (taken from 2A.2A and 2A.6K)
- I can predict and use parameter changes on rational functions. (taken from 2A.6G)
- I can use rational functions to represent real-life situations. (taken from 2A.6H)
- I can solve and determine reasonableness of solutions to rational equations. (taken from 2A.6I and 2A.6J)
- I can write the domain and range of rational functions using all three notations. (taken from 2A.6K and 2A.7I)
- I can create and solve equations using inverse variation. (taken from 2A.6L)
- I can add, subtract, multiply, and divide rational expressions. (taken from 2A.7F)

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Process:

- I can apply math to everyday life. (taken from 1A)
- I can create and use a problem solving plan. (taken from 1B)
- I can check my answer to see if it makes sense. (taken from 1B)
- I can solve problems with different stuff. (taken from 1C)
- I can solve problems with different resources (manipulatives, technology, etc.). (taken from 1C)
- I can use multiple ways to communicate math ideas. (taken from 1D)
- I can explain ways to solve math problems. (taken from 1D)
- I can use different representations to keep information organized when solving problems. (taken from 1E)
- I can think and talk about the relationships between math ideas. (taken from 1F)
- I can use math language to explain and defend mathematical ideas in writing or out loud. (taken from 1G)

TEKS:

Content:

(2) Attributes of functions and their inverses. The student applies mathematical processes to understand that functions have distinct key attributes and understand the relationship between a function and its inverse. The student is expected to:

(A) graph the functions ~~$f(x)=\sqrt{x}$,~~ $f(x)=1/x$, ~~$f(x)=x^3$~~, ~~$f(x)=\sqrt[3]{x}$~~, ~~$f(x)=b^x$~~, ~~$f(x)=|x|$~~, 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) Cubic, cube root, absolute value and rational functions, equations, and inequalities. The student applies mathematical processes to understand that cubic, cube root, absolute value and rational functions, equations, and inequalities can be used to model situations, solve problems, and make predictions. The student is expected to:

(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;

(H) formulate rational equations that model real-world situations;

(I) solve rational equations that have real solutions;

(J) determine the reasonableness of a solution to a rational equation;

(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
(L) formulate and solve equations involving inverse variation.

(7) Number and algebraic methods. The student applies mathematical processes to simplify and perform operations on expressions and to solve equations. The student is expected to:

(F) determine the sum, difference, product, and quotient of rational expressions with integral exponents of degree one and of degree two;

(I) write the domain and range of a function in interval notation, inequalities, and set notation.

Process:

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(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;

(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;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Targeted College and Career Readiness Standards:

- IC1, IIB1, IIC1, IIC2, IID1, IID2, VIIB1, VIIB2, VIIC1, VIIC2, VIIIA1, VIIIA2, VIIIA3, VIIIA4, VIIIA5, VIIIB1, VIIIB2, VIIIC1, VIIIC2, VIIIC3, IXA1, IXA2, IXA3, IXB1, IXB2, IXC1, IXC2, IXC3, XA1, XA2, XB1, XB2, XB3

Targeted ELPS:

- 1A, 1C, 1D, 1E, 1F, 1H, 2C, 2E, 2G, 2I, 3D, 3E, 3F, 3G, 3H, 3J, 4C, 4D

Academic Vocabulary:
Extraneous solution
Asymptote
Rational Function

Language of Instruction:
Cross Multiplication
Denominator
Inverse variation
Domain
Expression
Factoring
Horizontal Asymptote
Least Common Denominator
Numerator
Range
Solve
Simplifying
Transformation
Vertical Asymptote
Vertical Shift

	Horizontal Shift Reflection Vertical Stretch/Compression Horizontal Stretch/Compression

Instruction

Instructional Resources:

Module 9
9-1
9-2
9-3

Module 10
10-1
10-2
10-3

Technology:	**Career Connections/Real Life Application:**

(Info here)	(Info here)
Exemplar Lessons: (Info here)	**Research Based Instructional Strategies:** (Info here)
Assessment	
Student self-assessment & reflection: (Info here)	**Acceptable evidence or artifacts:** (Info here)