Grade 11 Functions

Chapter 2 – Rational Expressions

Learning Goals: We are learning to…

- determine whether polynomial expressions are equivalent
- simplify polynomials by multiplying. We are reviewing and extending our factoring skills.
- define rational functions, and explore methods of simplifying the related rational expression.
- multiply and divide rational expressions.
- add and subtract rational expressions.

Success Criteria: I can…

- recognize that functions can be equivalent at only a single value but not all values
- add and subtract polynomials by collecting like terms
- expand polynomials using the distributive property (FOIL)
- factor polynomials using a variety of methods (GCF, a=1, decomposition, difference of squares, perfect squares)
- simplify rational expressions by dividing out the GCF
- determine the restrictions from the factored form of the rational expression
- multiply rational expressions by following the appropriate steps
- divide rational expressions by multiplying by the reciprocal of the divisor, then following the multiplication steps
- determine the restrictions from the factored form of the rational expression
- add and subtract expressions through determining the LCD
- recognize that the LCD is not always the product of all the denominators
- identify restrictions from the factored form of the LCD

Chapter 2 – Rational Expressions

Learning Goals: We are learning to…

- recognize functions in various representations
- use function notation to represent linear and quadratic functions
- the graphs and equations of five basic functions; and using their tables, graphs, or equations to find their domains and ranges
- determine inverses of functions and investigate their properties
- apply combinations of transformations in a systematic order to sketch graphs of functions

Success Criteria: I can…

- determine the domain of a relation or function as the set of all values of the independent variable
- determine the range of a relation or function as the set of all values of the dependent variable
- apply the vertical line test to determine if a graph is a function

- recognize whether a relation is a function from its equation
- evaluate functions using function notation, by substituting a given value for x in the equation for f(x)
- recognize that f(x) = y corresponds to the coordinate (x, y)
- given y = f(x), determine the value of x
- identify the unique characteristics of five basic types of functions
- identify the domain and ranges of five basic types of functions
- identify when there are restrictions given real-world situations
- determine the inverse of a function using various techniques
- determine the inverse of a coordinate (a , b) by switching the variables: (b , a)
- recognize that the domain of an inverse is the range of the original function
- recognize that the range of an inverse is the domain of the original function
- understand that the inverse of a function is a reflection along the line y = x
- use the value of a to determine if there is a vertical stretch/reflection in the x-axis
- use the value of k to determine if there is a horizontal stretch/reflection in the y-axis
- use the value of d to determine if there is a horizontal translation
- use the value of c to determine if there is a vertical translation
- transform x coordinates by using the expression $\frac{1}{k}x + d$
- transform y coordinates by using the expression $ay + c$

<u>Chapter 3 – Quadratic Functions</u>

Learning Goals: We are learning to…

- represent and interpret quadratic functions in three different forms
- determine the maximum/minimum value of a quadratic function
- simplify and perform operations on radicals
- solve quadratic functions in different ways
- determine the number of zeros of a quadratic function
- the properties of families of quadratic functions
- solve problems involving the intersection of a linear and quadratic function

Success Criteria: I can…

- recognize a quadratic function in standard, factored, and vertex form
- determine the zeros, direction of opening, axis of symmetry, vertex, domain and range from the graph of a parabola
- determine the equation of quadratic function from its parabola
- recognize when a function has a maximum or minimum value (based on “a”)
- find the max/min (vertex) value using various methods (partial factoring)
- recognize “like” radicals. Totally awesome dude!
- write a radical in simplest form
- simplify radicals by adding, subtracting, multiplying, and dividing
- appreciate that a radical is an EXACT answer and therefore SUPERIOR to decimals

- solve quadratic functions by factoring, then setting each factor equal to zero
- solve quadratic functions by using the quadratic formula
- recognize that a quadratic function may have 0, 1, or 2 zeros
- use the discriminant of the quadratic formula to determine the number of zeros
- solve for "a" if given either the vertex or zeros
- solve for the points of intersection by
    - Making the functions equal to each other
    - Solving for the zeros (x-coordinates) of the resulting quadratic function
    - Substituting the zeros into the linear equation to determine the corresponding y-values
- identify when solutions are inadmissible

Chapter 4 – Exponential Functions

Learning Goals: We are learning to…

- work with integer exponents
- work with powers involving rational (fractional) exponents and to evaluate expressions containing them
- simplify algebraic expressions involving powers and radicals
- identify the characteristics and transformations of the graphs and equations of exponential functions
- use exponential functions to solve problems involving exponential growth and decay

Success Criteria: I can…

- apply the exponent laws
- recognize that a negative exponent represents a reciprocal expression
- understand that the numerator of a fractional exponent is the power, while the denominator is the root.
- simplify algebraic expressions containing powers by using the exponent laws
- identify the graph of an exponential function
- differentiate between exponential growth and exponential decay
- use the exponential function $f(x) = ab^x$ to model and solve problems involving exponential growth and decay
    - Growth rate is $b = 1 + r$. Decay rate is $b = 1 – r$.
    - r is a DECIMAL, not a percent!!!!!

Chapter 5 – Trigonometric Ratios

Learning Goals: We are learning to

- We are learning to evaluate reciprocal trigonometric ratios.
- use the Sine law to solve non-right angle triangles
- use the cosine law to solve non-right angle triangles

- use trigonometry to solve 3-dimensional problems
- find the EXACT values of sin, cos, and tan for specific angles.
- to use a Cartesian plane to evaluate trig ratios for angles between 0^o and 360^o
- prove trigonometric identities

Success Criteria: I can…

- I can use SohCahToa to determine the primary and reciprocal trigonometric ratios
- I can evaluate problems using the reciprocal trigonometric ratios
- I cannot use my calculator to directly solve a reciprocal trigonometric ratio
- I can recognize when the sine law applies and use it to solve for an unknown value
- I can identify, given S-S-A, that there will be two solutions (the ambiguous case)
- I can use the cosine law, given S-A-S or S-S-S
- I can rearrange the cosine law to solve for an unknown angle
- I can sketch, to the best of my ability, a representation of the question
- I can identify the correct method to solve the unknown(s) in a given problem
- I can draw the two special triangles
- I can identify the EXACT values for 30^o, 45^o, 60^o, using the special triangles
- I can evaluate EXACTLY (no calculators…OR capes!!!) problems involving the special triangles
- I can identify a positive or negative angle based on the direction of rotation
- If the principal angle (θ) lies in quadrants 2, 3, or 4 there is a related acute angle, β
- I can identify where a trigonometric ratio is + or – using the CAST Rule
- Every trigonometric ratio has two principal angles between 0^o and 360^o
- I can prove trig identities using a variety of strategies:
- Using the reciprocal, quotient, and Pythagorean identities
- Factoring
- Converting to sin and cos
- Common denominators
- I can recognize the proper form to proving trigonometric identities

<u>Chapter 6 – Sinusoidal Functions</u>

Learning Goals: We are learning to…

- interpret and describe graphs that repeat at regular intervals
- sketch the graphs of sinusoidal functions using transformations
- create a sinusoidal function from a graph or table of values
- solve problems related to real-world applications of sinusoidal functions

Success Criteria: I can…

- find the range, period, central axis, and amplitude of a periodic function
- determine IF a function is periodic
- sketch the graph of a sinusoidal function by applying the transformations to the parent function.
- create an sinusoidal function based on information from a graph or table

- recognize when it is best to use a sine or cosine function
- create a sinusoidal function that represents information from a real-life scenario
- use the function to solve further problems

Chapter 7 – Sequences and Series

Learning Goals: We are learning to…

- recognize the characteristics of arithmetic sequences, and express the general terms in a variety of ways
- the characteristics of geometric sequences and how to express the general terms in a variety of ways
- calculate the sums of the terms of an arithmetic sequence
- calculate the sum of the terms of a geometric sequence

Success Criteria: I can…

- identify when a sequence is arithmetic, by seeing if it has a common difference
- use the General Term Formula to develop an equation for an arithmetic sequence
- use the General Term to find any term in a sequence OR to find out how many terms are in a sequence
- recognize that an arithmetic sequence is always a linear function
- identify when a sequence is geometric, by seeing if it has a common ratio
- use the General Term Formula to develop an equation for an geometric sequence
- use the General Term to find any term in a sequence OR to find out how many terms are in a sequence
- recognize that an geometric sequence is always an exponential function
- calculate the sum of the first n terms of a arithmetic sequence by using one of the two formulas we learnt
- recognize when each formula is the most appropriate one to use
- add the first n terms of a geometric sequence
- recognize when each formula is the most appropriate one to use

Chapter 8 – Financial Math

Learning Goals: We are learning to…

- calculate simple interest
- determine the future value of a principal amount, using compound interest. This applies to both savings and loans
- determine the present value remaining on a loan or investment
- determine the future value of an annuity earning compound interest
- calculate the present value of an annuity earning compound interest

Success Criteria: I can...

- recognize that simple interest is calculated only on the principal
- Simple interest is an example of a linear function
- determine the related interest (i) per compounding period (n)

- use the Future Value formula to solve various financial quandaries
- calculate the total interest earned/paid by taking A – P.
- use the Present Value formula to solve various financial quandaries
- calculate the total interest earned/paid by taking A – P.
- recognize that an annuity is a “regular payment” on a loan or investment
- use the Future Value Annuity formula to solve various financial quandaries
- calculate the total interest earned/paid by taking $I=FV-(n\times R)$.
- recognize the difference between present value and future value
- use the Future Value Annuity formula to solve various financial quandaries
- calculate the total interest earned/paid by taking $I=(n\times R)-PV$.