

Algebra II Curriculum 2009-2010

Section numbers refer to Burger, et al., *Algebra 2* (Holt, Rinehart, and Winston, Orlando: 2007)

Part I: Algebraic Expressions and Equations

Unit I: Number Lines, Intervals, and Sets (approx. 9 days)

Sections 1-1, 2-1, 2-8

- (1) Understand the concept of discrete and infinite sets and interpret statements about the subsets, elements, union, and intersection of these sets
- (2) Use set and interval notation to express linear inequalities
- (3) Express the solution to linear inequalities graphically (on the number line)
- (4) Solve absolute value equations (with only one absolute value)
- (5) Solve compound inequalities
- (6) Solve absolute value inequalities

Unit II: Algebraic Manipulation: Rational Expressions and Exponents (approx. 13 days)

Section 1-5, 6-2, 6-3, 6-4, 6-6, 8-2, 8-3, 8-5

- (1) Use polynomial vocabulary correctly
- (2) Factor polynomials including greatest common factor, trinomials, difference of perfect squares, sums and differences of cubes, quadratic types, and factor by grouping
- (3) Use exponent rules to simplify algebraic expressions
- (4) Perform addition, subtraction, and multiplication of polynomials
- (5) Perform polynomial long division, and decide whether a divisor is a factor of the dividend or not [no synthetic division]
- (6) Identify rational expressions and equations
- (7) Identify values for which a rational expression and equation is undefined
- (8) Simplify factorable rational expressions by factoring and canceling factors that divide to one
- (9) Multiply and divide rational expressions
- (10) Add and subtract rational expressions both with and without like terms
- (11) Simplify complex fractions
- (12) Solve rational equations

Unit III: Radicals and Radical Equations (approx. 5 days)

Sections 1-3, 8-6, 8-8

- (1) Simplifying *numbers* under a square root, cube root, nth root [not variables]
- (2) Add, subtract, multiply and divide radical expressions (including rationalizing the denominator)
- (3) Understand that nth roots are fractional powers and simplify expressions with nth roots and fractional powers
- (4) Solving radical equations (only one radical in them)
- (5) Circles and distance formula (and midpoint formula)

Part II: Functions and Their Graphs

Unit IV: Function Basics (approx. 7 days)

Sections 1-6, 1-7, 6-5, 9-1

- (1) Identify independent and dependent variables in word problems
- (2) Understand relations (domain, range, correspondence) and determine whether a relation (expressed verbally, as a list of ordered pairs, as a mapping, or as a graph) is a function or a one-to-one function
- (3) Express the definition of a function
- (4) Use the vertical line test to identify if a graph represents a function; use the horizontal line test to identify if a graph is a one-to-one function
- (5) Graph a function using a table of values given its equation
- (6) Given the graph of a function a real number k , find $f(k)$
- (7) Given the graph of a function, find the zeros of the function
- (8) Given the graph of a function and a real number k , find all x such that $f(x)=k$.
- (9) Given the graph of a function, determine intervals for when $f(x)>k$, $f(x)<k$, $f(x)\geq k$, $f(x)\leq k$.
- (10) Understand relationship between graphs, equations, and t-tables; be able to move from any of them to any of the others
- (11) Identify the domain and range of a function by graphing
- (12) Identify domain from an equation algebraically
- (13) Express domain and range in interval and set notations

Unit V: Linear Functions (approx. 5 days)

Sections 2-3, 2-4, 2-7

- (1) Determine the slope of a line from its graph and give an interpretation of slope as a rate of change between independent and dependent variables given the equation, situation, or graph of the linear relationship
- (2) Graph a line given its equation in any form and find the equation of a line given its graph
- (3) Write the equation of a line given two points or a point and slope. Express the equation in point-slope and slope intercept form.
- (4) Find the x- and y- intercepts of a line
- (5) Express equations of vertical and horizontal lines
- (6) Determine if two lines are parallel or perpendicular
- (7) Find the equation of the line that is parallel or perpendicular to another line given the line and the point it passes through
- (8) Given a verbal description of a linear application, model the situation with a linear function and answer questions about the function, including an interpretation of slope in the context of the problem. Graph the function over an appropriate domain.
- (9) Given a set of data, perform a linear regression, identify whether the data is linear by looking at the plotted points, make predictions about the data (both interpolating and extrapolating), and draw conclusions about the prediction based on all these factors.

Mini-Aside #1: Matrices and Systems of Equations (approx. 3 days)

Sections 3-1, 3-2, 3-6, 4-1, 4-2, 4-5

- (1) Solving a system of linear equations in two variables, using graphs, substitution, and elimination
- (2) Add, subtract, and multiply matrices
- (3) Given a word problem, write the matrix equation that represents the situation
- (4) Use matrices and the graphing calculator to solve 2, 3, and 4 variable systems of linear equations [we will not introduce the determinant]

Unit VI: Functions, the Graphing Calculator, and Word Problems (approx. 3 days)

Section 6-5

- (1) Write equations describing basic area optimization problems
- (2) Interpret the meaning of the equation (what is the input, what is the output) verbally
- (3) Identify reasonable domain and range for the equations (find a reasonable window for the graph)
- (4) Use the calculator to find relative maxima and minima
- (5) Use the calculator to find increasing/decreasing
- (6) Interpolate and extrapolate, and analyze the reasonableness of these predictions

Unit VII: Functions, Reprise (approx. 3 days)

Sections 9-2, 9-4

- (1) Add, subtract, multiply and divide functions using function notation; identify the domain of a quotient of functions
- (2) Find the composition of two or more functions at a given value and the equation of its composition, algebraically, graphically and from a table.
- (3) Evaluate a piecewise function of a given value from an equation or a graph.

Mini-Aside #2: Complex Numbers (approx. 3 days)

Sections 5-5, 5-9

- (1) Add, subtract, multiply and divide complex numbers
- (2) Evaluate powers of i

Unit VIII: Quadratics (approx. 17 days)

Sections 2-5, 3-3, 5-2, 5-3, 5-4, 5-6, 5-7, 5-8

- (1) Review factoring
- (2) Solve quadratic equations in vertex form.
- (3) Complete the square to convert an quadratic equation from standard to vertex form.
- (4) Use the quadratic formula and discriminant
- (5) Given a quadratic function either in standard or vertex form, find the axis of symmetry, vertex, zeros, and y-intercept and graph using an appropriate table of values.
- (6) Graph quadratics with the leading coefficient not equal to one.
- (7) Identify solutions to 1 variable quadratic inequalities from looking at a graph (e.g. looking at the graph, when is the quadratic greater than 0)
- (8) Solving 1 variables quadratic inequalities using sign analysis
- (9) Solve linear inequalities in 2 variables (shading regions on graph)
- (10) Solve quadratic inequalities in 2 variables (shading regions on graph)
- (11) Solve quadratic-linear systems in 2 variables
- (12) Solve quadratic-linear system inequalities in 2 variables
- (13) Applications (including vertical motion)
- (14) Given a set of data, perform a quadratic regression, make predictions about the data (both interpolating and extrapolating), and draw conclusions about the prediction based on all these factors.
- (15) Model and solve vertical motion problems

Mini-Aside #3: Polynomials (approx. 2 days)

Sections 6-1, 6-6, 6-7

- (1) Identify end behavior of polynomials
- (2) Given two roots of a quadratic, find a quadratic function that fits these roots
- (3) Given a root of a cubic, find the other two roots

Part III: New Functions and Their Transformations

Unit IX: Transformations and Parent Functions (approx. 12 days)

Sections 1-8, 1-9, 7-2, 9-3, 9-5

- (1) Graph common parent graphs (by hand) including $f(x) = \sqrt[3]{x}$, $f(x) = \frac{1}{x}$, $f(x) = |x|$, and $f(x) = \lfloor x \rfloor$. Given graphs of common parent graphs, state the equation for the function.
- (2) Perform vertical and horizontal translations of common parent graphs and general function graphs (i.e., given $f(x)$, graph $f(x) + c$). Also, given a function and a translation of that function, state the equation of the translation.
- (3) Perform reflections of common parent graphs and general function graphs (i.e., given $f(x)$, graph $f(-x)$ and $-f(x)$). Also, given a function and a reflection of that function, state the equation of the reflection.
- (4) Perform vertical and horizontal stretching of common parent graphs and general function graphs (i.e., given $f(x)$, graph $cf(x)$ and $f(cx)$).
- (5) Review composition of functions
- (6) Find inverses of functions including those with restricted domains. Determine if a given function has an inverse by determining if the function is a one-to-one function using the horizontal line test. Recognize that functions and their inverses are reflections over the line $y=x$. Determine if two functions are inverses of each other.

Unit X: Exponential Functions and Applications (approx. 14 days)

Sections 7-1, 7-5, 7-7

- (1) Review exponent rules
- (2) Graph exponential functions by plotting points
- (3) Draw the base graph for exponential functions
- (4) Transform exponential functions (emphasis on growth and decay); find the domain and range of the transformed function
- (5) Solve exponential equations algebraically (but with “nice” answers) and graphically (with graphing calculator)
- (6) Given a verbal description of an exponential growth or decay relationship (fixed or continuous compounding):
 - (a) model the relationship with an equation;
 - (b) graph the function over an appropriate domain (manually and with a graphing calculator); and
 - (c) use the equation to answer various questions about the problem

Unit XI: Logarithms and Applications (approx. 8 days)

Sections 7-3, 7-4, 7-5, 7-7

- (1) Review inverse functions
- (2) Graph logarithmic functions by plotting points

- (3) Draw the base graph for logarithmic functions
- (4) Transform of logarithmic functions; find the domain and range of the transformed function
- (5) Use rules of logarithms (product, quotient, and exponent rule) to manipulate logarithmic expressions
- (6) Converting between logarithmic and exponential equations
- (7) Solve exponential and logarithmic equations with like and unlike bases algebraically and graphically
- (8) Understand how to create and interpret graphs using a logarithmic scale

Part IV

Unit XII: Introduction to Statistics (approx. 6 days)

- (1) Define and recognize a data set, discrete variable, continuous variables, and categorical variables, and quantitative variables
- (2) Define sample and population
- (3) Use a calculator to generate a simple random sample
- (4) Recognize that some methods of data collection can introduce bias into a study – response bias, question wording, voluntary samples
- (5) Construct dot plots, stem and leaf plots, and histograms for single-variable data
- (6) Interpret dot plots, stem and leaf plots, and histograms for shape, skewing, center, spread and outliers
- (7) Calculate the mean, range, and standard deviation for a set of data. Give an interpretation of the standard deviation
- (8) Calculate quartiles, percentiles, and construct a five-number summary and a box-plot for a set of single-variable data
- (9) State the properties of a normal distribution
- (10) Given the mean and standard deviation of a normally distributed variable find the proportion of data that is below, above or between specific values, using a graphing calculator

CALCULATOR SKILLS TAUGHT THROUGHOUT

- >Frac button
- choosing Xmin/max/scl and Ymin/max/scl for data/equation
- ZBox, ZDecimal, ZSquare, ZStandard, ZoomStat
- Inputting data into lists
- LinReg and QuadReg (including how to automatically put the data into Y1)
- maximum and minimum
- intersect
- value
- zero
- STO>
- abs
- \wedge
- how to view the TABLE and use TBLSET
- how to input, add, subtract, and multiply matrices
- how to find the matrix inverse
- 2nd ENTRY
- PlotOn/PlotOff
- Mode > Full/Horiz/G-T
- different line thicknesses when plotting