A guide to reviewing for the Algebra 31 Midterm Exam

1. Use your notes and note packets from class, rework examples and check them.
2. Use your returned assessments and homework, rework examples and check them.
3. Go to http://fairfieldschools.org/curriculum-instruction/high-school-course-selection/algebra-2-content-skills/ and explore the tutorials under the; (1) Functions Unit, (2) Polynomial & Rational Functions Unit as well as the (3) Exponential & Logarithmic Functions Unit.
4. Work through the Semester 1 Review packet which was provided electronically.

A comprehensive review will not be found in any single place or document. You must coordinate your studying across the 4 areas listed above. Topics to prepare for are listed below.

Algebra-31 Midterm Assessment 2015-2016

<table>
<tr><th colspan="2">Functions</th></tr>
<tr><td colspan="2">Essential Questions:
• What impact do different aspects of constants affect the transformation of a function?</td></tr>
<tr><td colspan="2">Big Ideas:
• Functions can be represented in multiple ways, including algebraic (symbolic), graphical, verbal, and tabular representations. Links between these different representations are important to study relationships and change.
• Functions are a single-valued mapping from one set-the domain of the function-to another-its range.</td></tr>
<tr><td>Understand the concept of a function and use function notation.
1) Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y=f(x).
2) Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Build new functions from existing functions.
3) Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even an odd functions from their graphs and algebraic expressions for them.
Analyze functions using different representations.
4) Graph piecewise-defined functions, including step functions and absolute value functions.</td><td>11 Tasks
(31 points)</td></tr>
<tr><td colspan="2">Khan Academy Tutorials
Functions Tutorials
Evaluating-piecewise-functions
Even and odd functions
Shifting and reflecting functions
Matching inputs & outputs
Evaluating functions
Evaluating functions expressions</td></tr>
</table>

Polynomials and Rational Functions

Essential Questions:

- How can we extend from real numbers to complex numbers?
- How can we solve equations with complex and real roots?
- How can we extend known rules of functions to analyze the structure of rational and polynomial expressions?

Big Ideas:

- The complex numbers are numbers that can be written in the form $a + bi$, where i denotes a square root of -1.
- The fundamental theorem of algebra states that every non-constant single-variable polynomial with complex coefficients has at least one complex root.

Perform arithmetic operations with complex numbers.

5) Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.
6) Add, subtract, and multiply complex numbers

Use complex numbers in polynomial identities and equations.

7) Solve quadratic equations with real coefficients that have complex solutions**.**
8) Know the Fundamental Theorem of Algebra (+)
9) Extend polynomial identities to the complex numbers (+)

Perform arithmetic operations on polynomials

10) Add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials.

11) Know and apply the Remainder Theorem
12) Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Rewrite rational expressions.

13) Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

Represent and solve equations and inequalities graphically.

14) Graph basic polynomials.
15) Use graphs of polynomial functions and inequalities to solve problems.

27 Tasks (62 points)

Khan Academy Tutorials

Complex Numbers Tutorials

Introduction-to-i-and-imaginary-numbers
Introduction-to-complex-numbers

Polynomial Functions Tutorials:

Adding, subtracting, and multiplying-polynomials
Polynomial-division
Synthetic-division
Polynomial-remainder-theorem
Factoring-higher-degree-polynomials
Polynomial-end-behavior

Exponential Functions

Essential Questions:

- How do exponential functions help us create models to describe data and physical phenomenon and solve problems
- How do we apply properties of exponents to whole number and rational exponents?
- How do we apply properties of exponents to whole number and rational exponents and their relationship to logarithms?
- How do we use technology to work with graphs and tables to solve problems and make sense of our world?
- How do we extend known rules of functions to exponential functions (transformations and operations)?

Big Ideas:

- Exponential functions are characterized by a rate of change that is proportional to the value of the function. It is property of exponential functions that whenever the input is increased by 1 unit, the output is multiplied by a constant factor.
- Exponential functions connect multiplication through addition through the equation $a^{m+n} = (a^m)(a^n)$.
- Under appropriate conditions, functions have inverses. For example, logarithmic functions are inverse functions of exponential functions and the square root function is the inverse of quadratic function.

Extend the properties of exponents to rational exponents.

16) Rewrite expressions involving radicals and rational exponents using the properties of exponents
17) Use the properties of exponents to transform expressions for exponential functions.

Understand solving equations as a process of reasoning and explain the reasoning.

18) Solve simple radical equations in one variable, and give examples showing how extraneous solutions may arise.

Represent and solve equations and inequalities graphically.

19) Graph exponential functions.
20) Use graphs of exponential functions and inequalities to solve problems.

Build New Functions from existing functions

21) Find inverse functions.

Analyze functions using different representations.

22) Graph exponential functions, showing intercepts and end behavior.
23) Graph square root and cube root functions.
24) Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.

Construct exponential models and solve problems.

25) Construct exponential functions given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

29 Tasks (48 points)

Khan Academy Tutorials

Exponential Functions Tutorials

Introduction-to-rational-exponents-and-radicals
Simplifying numerical radical expressions
Rational exponents and properties of exponents
Solving square root equations
Analyzing extraneous solutions of square root equations
Solving cube root equations
Domain of radical functions
Graphs of radical functions
Exponential-growth-functions
Word-problem-solving-exponential-growth-and-decay
Introduction-to-function-inverses