Final Review

Your best tools for studying for the final you already have! Look at quiz reviews, old quizzes and the midterm. Homework questions are also fair game. If there were any sections in particular that you struggled with check out the Chapter Review, as it offers additional practice questions.

I really want to you to show me that you learned something, understand the concept and know how to apply it. Memorizing formulas and definitions only won't get you through the exam. Definitely expect an application problem or two. I will do my best to break it into as small of pieces to walk you through solving the question. The last question from the midterm is a great example of how I might do that.

Here is a comprehensive list of concepts that we covered. It's long, but that only goes to show how proud you should be of yourselves. This is a tough, fast paced course.

1. Difference Quotient- You should be sick of this by now. Know how to use it. Understand that it is a slope! How do all the components of the equation compare to the components of the equation for slope of average rate of change? Do you see the similarities?

2. Exponential and Logarithmic functions/equations- This section is of HUGE importance whether or not you move on in math or not. They are everywhere in the real world. Know some of their applications (Finance, Biology, Probability, Radioactive decay, Age, etc). Most importantly, **understand that they are inverses of each other!!**
    a. What happens if I compose an exponential function with a logarithmic function of the same base? What would you expect to get out
    b. $B^E = N$ means $log_B N = E$
    c. Remember when solving, you always want to isolate the exponential /logarithmic part of the function first. Divide by any constants that you have out front before take the power/log.
    d. Understand how the exponential rules/properties align with the logarithmic rules/properties
    e. In order for these functions to be/have inverses, what must be true about them? (i.e. what kind of functions are they?) What line test(s) must they pass?
    f. What properties to the graphs of each of these functions have? Think domain, range (how do these to relate between exponential and logarithmic functions), asymptotes, 3 key points.

3. Graphing, Domain and Range of any function or transformation of any function in our library of functions

a. When looking for domain, division by zero and keeping the inside of even radicals are the first things we look for! For logarithms, we just want to keep the inside of the log greater than zero. Be able to calculate the domain for range for every function.
b. What are all the different types of transformations that we have?
    i. Vertical Shift- this affects the outputs . It can also affect the Range. Does it always? Can you think of an example of where it wouldn't? How about where it would?
    ii. Horizontal Shift- this affects the inputs. It can also affect the Domain. Does it always? Can you think of an example where it wouldn't? How about where it would?
    iii. Vertical Stetch/Compression- Which types of values give you the stretch, which give you the compression? Why?
    iv. Horizontal Stretch and Compression- You should know that it changes the inputs, but that's about all. I won't cover them much on the final
    v. Reflections- what causes a reflection over the x-axis? Why? What causes a reflection over the y-axis? Why?
    vi. You should be able to graph all functions/questions on this test without the use of a calculator.

4. Rational function/Graphing Polynomials (why might I combine these two? What is a rational function made up of?)
    a. Concerning rational functions, here are the take aways: They are fantastic embodiments of what vertical and horizontal asypmtotes are, the importance domain, use of the power function and end behavior, what it means to find zeros.
        i. What is the power function (remember it includes the coefficient)
        ii. How do you calculate the degree of a function- what does this tell you about the end behavior.
    b. Asymptotes- which can we cross, and which can't we cross? Why?
        i. You should be able to calculate the horizontal/oblique, and vertical asympototes-where do we get each one from? Why does it work this way?
        ii. You should be able to find all x & y intercepts. Where do we get the x intercepts from?
        iii. What is a hole? Understand why it results in a hole in the graph rather than an asymptote
        iv. Understand multiplicities of zeros. What do they tell us about the functions behavior at the zero/root.
    c. The worksheet we did in class and homework questions are good study guides for this section.
    d. This is a good place to practice factoring!!!
    e. Be able to recognize local max/min, absolute max/min, intervals of decreasing and increasing

5. Composition and Inverses of functions (some of this is already covered in exponential and logarithmic functions)
    a. Be able to find the domain of the composition of any two functions? Remember to you have to satisfy **two** conditions and consider both functions- what are they?
    b. What is the result of composing a function and its inverse?
    c. Be able to deconstruct/construct a composition of two functions. (i.e. if $H(x) = |x + 2|$ what is a possible $f(x)$ and $g(x)$ such that $H(x) = f(g(x))$
    d. What is mandatory of a function in order to find its inverse?
        i. What modifications can we make to a domain to satisfy the mandatory condition (this is also a test question)

6. Absolute Value functions and Solving inequalities
    a. At a very basic level, what is the absolute value giving us? (your answer should include distance… and distance is always…)
    b. Know how to solve equations and inequalities using algebra and graphing techniques
        i. Remember to isolate the absolute value before you break it into two parts
        ii. What are you looking for on a graph if $f(x) = g(x)$? (this was a quiz question)
        iii. Understand that when you are solving inequalities, you are solving for all the possible x values that will make the statement true. Very rarely will you only find one value that makes it work.

7. Linear equations
    a. Know all of their components- slope, y-intercept
        i. How do you calculation the slope?
        ii. How can you find the equation of a line given the slope and one point on the line?
    b. Know that this is the form of secant lines- how do we find these? What are they?

8. Quadratic Equations and Complex zeros
    a. What is the discriminant? What does it tell us about the zeros of our quadratic equation
    b. How can we use factoring to help us? What kind of zeros do these give us (real or not real)
    c. How can we determine if the function is opening up or down? How will this determine whether the vertex is a max or min.
    d. Be able to find the vertex of a quadratic function
    e. Know that complex zeros come in conjugate pairs- what does this mean? Why is this true? How do we find them.
    f. When we factor a polynomial- what two types of factors do we get? (hint: linear factor is one…what is the other)?
        i. Which one of these do the complex zeros come from

9. Direct and Indirect Variation- know what it is, how to set it up and how to solve.

10. Geometry- This will more than likely manifest itself in an application problem. I will give you any reasonable equations but you should know the following
    a. Area of a Circle
    b. Circumference of a Circle
    c. Area of a triangle
    d. Area and Perimeter of a rectangle/square