Midterm Review

1. Feel comfortable with anything from the Quiz 1 and Quiz 2 Reviews **(This is the most important part)**
2. Chapter Review Problems from the book if you need extra practice
    a. **Ch. 1 Review (pg. 113):** 1,2, 4, 9, 10, 13, 15, 17, 19, 25, 40
    b. **Ch. 2 Review (pg. 184):** 1, 6, 7, 9, 13, 15, 16, 19, 21, 22, 24, 25, 27, 31-37 odd, 41, 45, 48
    c. **Ch. 3 Review (pg. 267)**: 1, 4, 5, 7, 11, 13, 19, 25, 27-31 odd
    d. **Appendix sections** – All of the appendix sections are prerequisite material and should be known. Try some of the even problems from the same sections where homework came from
3. Library of functions
    a. Know how to quickly sketch all of these, their domains and ranges, and 3 key points
    b. Be able to graph any of the these functions with the following transformations
        i. Vertical Shift (up and down)- what does this look like? Does it affect inputs (domain) or outputs (range)?
        ii. Horizontal Shift (left and right)- what does this look like? Does it affect inputs or outputs?
        iii. Vertical Stretch/Compression- for what values of a do we get one vs. the other? How does this affect the domain and range?
        iv. Reflection- What will reflect the graph over the x-axis? What will reflect the graph over the y-axis? How does this affect the domain and range?
4. Graphing higher degreed polynomials: Things you should know
    a. **End behavior**- how is this determined?
    b. **The degree of the function**- make sure you pay close attention to a function that is in factored form vs. expanded form
    c. **The Power function**- make sure you include the leading coefficient
    d. **Finding the real & complex zeros (know the difference between the two!):**
        i. Factoring & Zero Product Property
        ii. Quadratic equation (check the discriminant! What can this tell us about the number and types of zeros that we have)
        iii. Completing the square
        iv. Rational Zeros theorem (p's and q's!)
        v. Synthetic Division
        vi. Intermediate Value Theorem
        vii. Descartes Rule of Signs and Upper/Lower Bounds (I will provide these to you on the exam)
    e. **Multiplicity of zeros-** When will the graph cross vs. touch?
    f. **Turning Points-** How many can a given graph have? What dictates this?
5. Characteristics of polynomial functions
    a. **Intervals of decreasing/increasing behavior-** for what intervals is the graph increasing? Decreasing?
    b. **Local vs. Absolute Max/Min-** which one includes the end points? Why is this the case? Know proper notation.

6. Characteristics of Quadratic Functions
    a. What are the domain and range? How does this change with transformations
    b. What degree do they have?
    c. Be able to find the following:
        i. Vertex (this should be written as a coordinate pair)- what determines if the vertex is a minimum or maximum?
        ii. Axis of symmetry (this should be written as an equation of the form $x=a$, where a is what?)
        iii. Y-intercept (written as a coordinate pair)
        iv. X-intercepts (written as a coordinate pair)
        v. Does it open up or down?
        vi. 3 key points
7. Absolute Values
    a. You should understand that an absolute value represents a distance from 0, and we always measure distances to be positive
    b. Know the common characteristics of the graph
    c. Know that when solving an absolute value equality *or* inequality we want to split it into two different statements
8. $\frac{y1-y2}{x1-x2}$DIFFERENCE QUOTIENT!!!!!!!!!!!!!!!!
    a. Know that this is just representing a slope. If we define slope as $\frac{y1-y2}{x1-x2}$ then what are the corresponding parts in $\frac{f(x+h)-f(x)}{h}$?
9. Complex Numbers
    a. Know how to multiply them
    b. Know how to multiply by the conjugate reciprocal
    c. Know what the conjugate is
    d. Know the powers of *i*
10. Functions
    a. Know what defines a function
    b. What two things do we look for when determining the domain of a function?
    c. Linear operations of fucntions: $(f+g)(x), (f-g)(x), (f*g)(x), (\frac{f}{g})(x)$ (how is the domain affected by these?!)
11. Application Problem- Be ready for one. Chances are it will incorporate a few of the concepts above. For example:
    a. You are throwing a , whose height above the ground is modelled as a function of time by the quadratic function $h(t)$. Graph this function. At what time does the ball hit the ground? What kind of transformations have happened to the parent function $f(x)=x^2$ to get to the function in this problem? What is the maximum height that the ball reaches? Say you wanted to throw this ball from a building that was 10 ft high, how would you change your equation? What is the domain and range of this function? Etc.