Quiz #6 Review – Sections 3.1 – 3.3 and 3.5

3.1 Polynomial Functions and their Graphs... Know:

1) ...the anatomy (and terminology) of a polynomial (bottom half of pg 250)
2) ...what the graphs of polynomials look like (smooth and continuous) pg 251
3) ...in general, what odd vs even degree functions look like when graphed. Top of pg 253
4) ...basic transformations for those functions (especially when "a" is negative) pg251 Ex 1

   Review practice: pg 317 #1-5odd

5) ...how to describe "end behavior" of a function by looking at its graph. Top of pg 253
6) ...how to describe "end behavior" of a function given the equation (basically make a simple sketch of the leading term(reflect over x-axis if negative) then describe the end behavior based on your sketch.) pg 253 Ex. 2 and 3

   Review practice: pg 317 #7-10 all

7) ...how to graph polynomials by hand(no calculator) See steps a-e below and view pg 256 along with Examples 4, 5, 6, 7
   a) Find and plot y-intercept, and all x-intercepts (zeros) if they exist
   b) Determine the multiplicity of each zero...remember odd multiplicity means the graph will pass through the zero, even multiplicity means the graph will bounce off of that zero. MULTIPLICITY is explained in more detail on pg 259-260 See Ex 8
   c) Determine the end behavior from leading term of polynomial and sketch those branches.
   d) Find and plot a point between each zero (at least one...but more will get a more accurate graph)
   e) Based on the evidence above, carefully sketch your graph

   Review Practice: pg 317 #29b-35b odd (not part "a" for this section)

8) ...how to how many potential Local Extrema (meaning "local/relative" max or min) and how to find them by looking at a graph or given a polynomial and using a graphing calculator. See pg 260 for explanation and See Ex.9

   Review practice: pg 317 #7-10 all

3.2 Dividing Polynomials...Know:

1) The notation and vocabulary for the different parts of division.
   a) P(x) is the Dividend
   b) D(x) is the Divisor
   c) Q(x) is the Quotient
   d) R(x) is the Remainder

2) That you may be asked to state your answer in one of the following formats:
   a) $\frac{P(x)}{D(x)} = Q(x) + \frac{R(x)}{D(x)}$
   b) $P(x) = Q(x) \cdot D(x) + R(x)$

3) How to use long division (there will be questions that state you must use long division) see pg 266 Ex1, Ex 2 and bottom of pg 267 for another long division example.

   *Remember...Don't forget to include "filler" 0 terms for missing degrees in the dividend and Divisor...AND...Divide, multiply, subtract(distribute negative and add columns), drop(the next term) and repeat until the remainder has a lower degree than the divisor.

   Review practice: pg 317 #17-20 all

4) How to use synthetic division(this only works with a divisor that is linear...if the divisor is not linear, you will need to factor the divisor so that it has at least one linear

factor…then use the zero of that factor in your synthetic division) See pg 267-269 Ex. 3 and Ex 4 for synthetic division examples

*Remember…Don't forget to include "filler" 0 terms for missing degrees in the dividend….AND the steps are…Drop, multiply, add, repeat

Review practice: pg 317 #17-20 all

5) <u>Remainder Theorem</u> – simply means that the remainder that you get when doing $\frac{P(x)}{x-c}$ (With Long or synthetic division) is the same answer you would get if you did P(c). See Ex 4 on pg 269 **Review practice: pg 317 #21,22**

6) <u>Factor Theorem</u> – simply states that (when dividing $\frac{P(x)}{x-c}$) if you get 0 as a remainder, then x- c must be a factor of P(x)…therefore "c" must be a "zero" of the P(x). See pg 269 Ex 5. **Review practice: pg 317 #23,24**

7) How to find a polynomial with specified zeros. Remember to work backwards…see pg 270 Ex6 **Review practice: pg 318 #48**

<u>3.3 Real zeros of Polynomials</u>…

1) Rational Zeros Theorem – If a polynomial has rational zeros…those rational zeros will be found in the following potential list of rational zeros:

Potential Rational Zeros = all combinations of $\pm \frac{\textit{Factors of the Constant term}}{\textit{Factors of the Leading Coefficient}}$

Review practice: pg 317 #27a,28a

2) Know how to <u>find all rational zeros</u> of a polynomial as shown on pg 273 Ex1 and pg 274 Ex3 **Review Practice: pg 317 #29a-35a odd (not part "a" for this section)**

3) Know how to factor a polynomial as shown on pg 273 Ex2

Review practice: pg 319#3b,6

3.5 Complex (and Real) zeros of Polynomials…

1) The concepts in this section are mainly a repeat of concepts from section 3.3, but the only difference is that you will encounter imaginary solutions and be asked to find them.

2) You will need to recall the following

a) A <u>complex number</u> is a + bi where "a" is a real number part and bi is the imaginary part… even the number -3i is called a complex number as it is in the form 0 – 3i…don't get too hung up on the "complex" vs "imaginary" number thing at this point.

b) You will also recall this <u>important fact</u> … $i = \sqrt{-1}$, thus $i^2 = -1$

3) Know how to <u>find ALL zeros (Real and Complex) of a polynomial</u>. See pg 292 Ex1, Ex2, pg295 Ex5 and pg 298 Ex8 **Review practice: pg 318 #51-57odd**

4) Know how to <u>find the factors ("complete factorization") of a polynomial</u>. See pg 292 Ex1, Ex2, Ex3 **Review practice: pg 298 #15-27EOO**

5) How to find a polynomial with specified zeros. Remember to work backwards…see pg 295 Ex4 and pg 296 Ex6 **Review practice: pg 319 #7**