Pre-Calculus - Chapter 2 Study Guide

This is a summary of Chapter 2. The indicated Section problems are meant as a guideline to the type of problems that are on the test. You DO NOT have to do all of them. It is suggested to do a couple or more (as needed) from the odds and check the answers on the back of the book. If you feel confident on a given section, skip it and concentrate on those sections where you feel you need the most help.

2.1- Operations with Complex Numbers a + bi

2.2- Graphing Parabolas: Prob.→(#17-43)

- Vertex. $x = \frac{-b}{2a}$ then plug in "x" to find "y". **The vertex is a point**.
- Find the intercepts: x-int →set y = 0 y-int→set x = 0.
- Find the equation and graph the axis of symmetry. $x = \frac{-b}{2a}$ **The axis of symmetry is a line.**
- Graph the vertex, and intercepts. Use reflection to graph additional points. There should be at least 5 points, unless otherwise indicated. (There may be more points requested on the test). Graph the parabola. (Must look symmetric about the axis of symmetry).
- The Maximum is the y-value of the highest point.
- The Minimum is the y-value of the lowest point.
- The Domain is all the possible x-values. For parabolas opening up or down, the Domain is $(-\infty, \infty)$.
- The Range is all the possible y-values from [Max/Min]. It varies depending on the parabola.

2.2- Maximum Area Prob.→(#65-70)

- Include drawing.
- Use the equation for the length of the fence and the equation of the Area, either A(l) or A(w).
- Find the vertex. → ***X-Value*** will be length or width. ***Y-Value*** will be the **MAX AREA**
- Find the other dimension with the correct units.

2.3- Graphing Polynomial Functions: Prob.→ (#41-63)

- Find all the zeros by factoring and setting = 0
  - Use the Fundamental Theorem of Algebra to determine if you have the correct number of solutions. The degree of the polynomial = number of solutions. Remember that solutions could be repeated. Ex. x = 3, x = 3, x = 1 count as 3 solutions. Therefore the polynomial´s degree = 3.
- Find the y-intercept. Set x = 0.
- Approximate the Critical Points.
- Use the end-behavior and the number of turns $(n-1)$ to graph.

2.4- Finding the zeros of Polynomial Functions, Remainder and Factor Theorems: Prob.→(#1-45)

- Practice dividing polynomials using Long and Synthetic Division.
- The Remainder Theorem $(If\ a\ polynomial\ is\ divided\ by\ (x-c), then\ f(c) = Remainder)$
- The Factor Theorem $(If\ f(c) = 0, then\ (x-c)\ is\ a\ factor\ of\ the\ polynomial.)$

2.5-Using the Rational Root Theorem to find the rational zeros of Polynomial Functions. Finding All the Zeros of Polynomial Functions. Prob.→(#1-37).

- Find the possible rational zeros $(\frac{P}{Q}'s)$ – **Rational Root Theorem**
- Find one that works using the remainder and factor theorems. $Ex: If\ f(2) = 0, then\ x-2\ is\ a\ factor.$
- Use synthetic division to find the remaining factors to factor completely.
- Set each factor = 0 and solve.

- If a **quadratic factor** does not factor further, then use the quadratic formula to solve it. This will give you 2 zeros that are either irrational or imaginary. Only the $(\frac{P}{Q}'s)$ will give you the ***possible rational zeros***.
- Find the zeros.
- Use *Descartes´s Rule of Signs* to determine the possible real positive and the possible real negative zeros.

2.6- Graphing Rational Functions: Prob.→ (#57-87). (Also review the study guide for 2.6)

- Find the Vertical Asymptote(s): **(VA)** and **Holes**. **[These exist if and only if there is a *Domain Restriction*]**
  ***Factor the numerator and denominator:
  - If any factor from the denominator cancels with factors from the numerator, set = 0 and that will give you the **x-value** **[Domain Restr.]** of a ***hole*** in the graph. To find the **y-value**, plug in the x-value into f(x). **The holes are points (x,y).** **remember to simplify F(x) before finding the **y-value**
  - **Factors** from the denominator **that do not cancel** will become **Vertical Asymptotes**. Set = 0 and solve for **x→ Domain restriction(s) that are not Holes.**
  - There may be no Vertical Asymptote or several Vertical Asymptotes. Technically, there is no limit to the number of Vertical Asymptotes in Polynomial Functions.
  - **Note: Vertical Asymptotes are lines, therefore the equation will be x = Domain Restr.**
- Finding Horizontal Asymptote: **(HA)** if any. (y = constant). Rules:
  - 1- If the degree of the numerator **<** the degree of the denominator, **then** $y = 0$. [x-axis]
  - 2- If the degree of the numerator **=** the degree of the denominator, **then** $y = \frac{LC\ Num.}{LC\ Den.}$
  - 3- If the degree of the numerator **>** the degree of the denominator, **then** **NO HA.**
  - There can be 0 or 1 Horizontal Asymptote.
  - **Note: The Horizontal Asymptote is a line, therefore the equation will be y = #**
- Finding Slant Asymptote: **(SA)**
  - If the degree of the numerator **>** the degree of the denominator **by exactly one unit**, then there is a Slant Asymptote.
  - Use synthetic or long division to divide.
  - The Slant Asymptote will be **y = quotient of the division**. *Disregard the remainder*.
  - **Note: The Slant Asymptotes is a line, therefore the equation is y = quotient of the division**
- Find the y-intercept: set x = 0 and solve.
- Find the x-intercept(s): set f(x) = 0 and solve. ***[set –numerator--p(x) = 0]***
- Use tables of values with at least 3 points each to the ***left, right***, and ***between Vertical Asymptotes***. Try to use x values close to the asymptotes.
  - Graph the branches.

2.7- Solve polynomial and rational inequalities: Prob.→ (#1-59)

- Find the **zeros** and **Domain restriction(s)** (if any).
- Draw a number line with intervals including the ***zeros*** and ***restrictions***.
  - Test values of "x" on each interval.
  - **(**Parenthesis**)** for $\infty, -\infty$, restrictions and if function contains $>$ or $<$.
  - **[**Brackets**]** for zeros if function contains $\leq$ or $\geq$.
- Test values of "x" on each interval.
- Write the solution by selecting the interval(s) that satisfy the given function.

2.8- Prob.→ #94, 95, 97 Modeling with variation

- Direct variation: y = kx
- Inverse variation: $y = \frac{k}{x}$
- Joint variation: y=k(a)(b)(c)
- Combined variation: combination of direct, inverse and/or joint.