

Summary for Midterm One - Math 120

Here are some thoughts I was having while considering what to put on the first midterm. The core of your studying should be the assigned homework problems: make sure you really understand those well before moving on to other things (like the old midterms on the test archive).

- Chapter 1 - Warm Up
 - One of the most important ideas of this chapter is that of *multiplying by one* as a means of unit conversion. This idea makes all unit conversions have a common method, and helps one's notekeeping.
- Chapter 2 - Imposing Coordinates
 - This chapter introduced the use of the *coordinate system* and the *distance formula*.
 - A classic problem from this chapter is the one in which two objects are moving and we need to describe the distance between them, like problems 2.13 and 2.14.
- Chapter 3 - Three Simple Curves
 - This chapter introduces circles and horizontal and vertical lines. You should be sure you are comfortable finding the equation of a circle from a variety of descriptions.
 - You should be able to find the intersection of a circle with a vertical or horizontal line.
 - The classic problems from this chapter are 3.4 and 3.7.
- Chapter 4 - Linear Modeling
 - In this chapter, we get the general line definition. Be sure you are able to find the intersection of a given circle with a general line.
 - We also have the idea of perpendicular lines, and the method for finding the shortest distance between a line and a point not on that line.
 - Especially good problems are 4.8, 4.12, 4.14 and 4.15.
- Chapter 5 - Functions and Graphs
 - Here the *function* is introduced.
 - Every function has a domain, range and graph. Be sure to know what each is, and how to determine it for a given function. As we said, finding the range and graph can be hard; rest assured, if asked to find the range or graph of a given function, it will be doable.

- You should be comfortable with *multipart* functions (what are they, how to evaluate one, how to solve equations involving them, etc.) What’s an example of a multipart function?
 - I like problems 5.5 and 5.10 especially.
- Chapter 6 - Graphical Analysis
 - Chapter 6 talks about a variety of graph-related topics.
 - You should understand how to graph a multipart function, where each part is linear.
 - Especially good problems are 6.3 and 6.4.
- Chapter 7 - Quadratic Modeling
 - The *quadratic* function is introduced. You should know the significance of the *vertex* and how to find it. You should be able to sketch the graph of a given quadratic function.
 - You should have experience find the maximum or minimum possible value of a quantity by expressing it as a quadratic function of some other quantity (e.g., area of a rectangular enclosure as a function of the width of the enclosure, etc.). Problem 7.9-7.13 all involve this idea.
- Chapter 8 - Composition
 - In addition to combining two functions into a new function via arithmetic (the way we can combine two numbers into a new number), we can also combine two functions via *composition*.
 - You should understand what $f(g(x))$ means, and how to express a rule for $f(g(x))$ given rules for $f(x)$ and $g(x)$.
 - I especially like problems 8.3, 8.4, 8.5.
- Chapter 9 - Three Construction Tools
 - You should understand horizontal and vertical **shifting**, and horizontal and vertical **scaling** (aka dilating)
 - You should understand how to derive the graph of $g(x) = af(bx + c) + d$ from the graph of $f(x)$ (see, e.g., problem 9.2)
 - I especially like problem 9.2, 9.3, and 9.7