Math 20B Final Exam Review Outline
Winter 2020

The Math 20B first midterm exam will cover textbook sections 5.6, 5.7, 6.1, 6.2, 6.3, 7.1, 11.3, and 11.4 (the material discussed in lecture during Week 1, Week 2, Week 3, and Monday of Week 4).

Below is a summary of the topics/skills you need to master from each of the sections. We suggest that you start by solving the examples from your lecture notes, and then moving on to re-doing enough of the assigned homework problems from each section in order to feel confident about the main concepts. When you are solving the aforementioned problems, it is of the utmost importance that you attempt to solve them without looking at our solutions or solutions/hints on Webassign. This is the only way to really make the solutions your own. If you are able to understand and solve all of the lecture examples and the homework problems on your own and without any assistance, then you should do very well on this exam.

- Section 5.6: Given a velocity function, know how to use definite integrals to calculate displacement and total distance travelled.
- Section 5.7: Know how to evaluate integrals using u-substitution. If you are using u-substitution to evaluate a definite integral, don’t forget to change the limits of integration.
- Section 6.1: Know how to find the area of a plane region by setting up and solving a definite integral. It is often helpful to sketch the region first, see the list of prerequisite skills at the bottom of this page.
- Section 6.2: Know how to find the volume of a solid with a given base and given cross-sections by setting up and solving a definite integral. Know how to calculate the average value of a given function over a specified interval.
- Section 6.3: Know how to find the volume of a solid of revolution by setting up and solving a definite integral. Remember that solids can be generated by rotating a plane region about the \( x \)-axis, the \( y \)-axis, or any other vertical or horizontal line, so practice all of the possible variations.
- Section 7.1: Know how to evaluate integrals using integration by parts. Remember that for some problems you need to apply integration by parts more than once and/or combine integration by parts with \( u \)-substitution.
- Section 11.3: Given the Cartesian coordinates of a point, know how to find its polar coordinates and vice versa. Know how to plot points using their polar coordinates. (You won’t have an exam question that resembles the homework from section 11.3, but you need to understand the 11.3 material to do the area problems from 11.4, and you may have a exam question that resembles the homework from section 11.4).
- Section 11.4: Know how to find the area of a region described by polar equations.

In addition to the above topics, many problems require prerequisite knowledge:

- Know how to evaluate trig functions at standard angles, e.g. \( \sin(\pi/3) \), \( \cos(\pi) \), etc.
- Know the definitions of \( \sec(\theta) \), \( \csc(\theta) \), \( \arcsin(t) \), \( \arccos(t) \), and \( \arctan(t) \).
- Know the trig identities used for evaluating the integrals in section 11.4: \( \sin^2(x) = \frac{1}{2} - \frac{1}{2} \cos(2x) \) and \( \cos^2(x) = \frac{1}{2} + \frac{1}{2} \cos(2x) \).
- Know how to graph basic functions:
  (1) lines: \( y = mx + b \)
  (2) parabolas: \( y = ax^2 + bx + c \), for example: \( y = 2x^2 - 4x - 16 \)
  (3) simple power functions: \( y = x^3 \) and \( y = \sqrt{x} \)
  (4) simple rational functions: \( y = \frac{1}{x-a} \) and \( y = \frac{1}{(x-a)^2} \)
  (5) \( y = \sin x, \ y = \cos x, \ y = e^x, \) and \( y = \ln x \)
- Know all of your derivative formulas from Math 20A so that you can check your integration answers.