

Math 10B Midterm Exam Two Review Outline

Math 10B, Winter 2018

Midterm Exam Two is cumulative and may test you on any concepts covered since the first day of class, but the emphasis is on the topics discussed in lecture during Weeks 4, 5, 6 and 7, namely Sections 5.6, 5.7, 5.9, 5.10, 6.1, and 6.2. Below is a summary of the topics/skills you need to master from each section; in some cases, example problems from the textbook homework assignments are provided to illustrate what is meant by the particular skill. **Please note that although section 5.5 (u-substitution) was on the first exam, you will also see it in several places on this second exam because it is frequently used in sections 5.6-6.2.**

- Section 5.6: Know how to solve integrals using integration by parts. Remember that sometimes you need to apply integration by parts more than once and that sometimes you need to combine integration by parts with u -substitution.
- Section 5.7
 - Topic One: Know how to solve integrals using u -substitution together with the following identities:
$$\sin^2(x) + \cos^2(x) = 1, \quad \sec^2(x) - \tan^2(x) = 1$$
(e.g. as in HW 5.7.1 or HW 5.7.10).
 - Topic Two: Know how find the partial fraction expansion (PFE) of a given rational function and then use the PFE to find the antiderivative of the function.
 - Topic Three: Know how to solve integrals using trig substitution (know how to use the three substitutions $x = a \sin \theta$ and $x = a \tan \theta$ and $x = a \sec \theta$) (e.g. as in HW 5.7.16, but exam questions would not be multiple choice).
- Section 5.9: Know how to use the Trapezoidal Rule to approximate a definite integral.
- Section 5.10:
 - Topic One: Know how to use the definition of an improper integral as a limit to determine whether it converges or diverges. Know how to do both types of improper integrals: continuous function on infinite interval of integration (e.g. as in HW 5.10.8) and function with discontinuity at one endpoint of a finite interval of integration (e.g. as in HW 5.10.26). On the finite interval of integration problems, remember that you should write a one-sided limit, not a two-sided limit.
 - Topic Two: Know how to determine convergence or divergence of an improper integral using the Comparison Theorem. Note that if we expect you to use the Comparison Theorem to solve a problem, then we will tell you to use it in the instructions for that problem.
- Section 6.1: Know how to find the area of a plane region by setting up and solving a definite integral. Note that as in your homework, if the region is enclosed by simple functions like lines and parabolas, you may be asked to sketch the region (e.g. as in HW 6.1.8 or HW 6.1.9).
- Section 6.2: Know how to find the volume of a solid by setting up and solving a definite integral. In particular, you may be asked to find the volume of a solid obtained by revolving a plane region about a line (e.g. as in HW 6.2.1 or HW 6.2.12), or you may be asked to find the volume of a solid described in terms of its base and cross-sections (e.g. as in HW 6.2.43).

In addition to the calculus topics, make sure to review your pre-calculus skills:

- Know how to evaluate trig functions at standard angles, e.g. $\sin(\pi/3)$, $\cos(\pi)$, etc.
- Know the definitions of $\sec(\theta)$, $\csc(\theta)$, $\arcsin(t)$, $\arctan(t)$
- Know how to graph basic functions:
 - (1) $y = mx + b$, e.g. $y = 3x - 2$, $y = 6$, etc.
 - (2) $y = ax^2 + bx + c$, e.g. $y = 12x^2 - 17x + 6$, etc.
 - (3) $y = x^3$
 - (4) $y = \sin x$
 - (5) $y = \cos x$
 - (6) $y = e^x$
 - (7) $y = \ln x$