

MATH 2425
CALCULUS II
Lab 5: Week of September 28- October 2
Use of Integral Tables

Study Technique 4

Try this technique to help you prepare for a test. A couple/few days before the test, look over all the homework. The day/night before the test, look over the homework again, and ask yourself what the key concepts and methods are per question (WITHOUT reworking the questions). Jot this down on a sheet of paper and when you are done, compare with the solutions to see if you were correct. Any question in which you were on the wrong track, look over your solution to it to make sure you see what the main idea is. This work the day/night before will help get your brain to think faster and bring the material to the front of your brain to help you think faster during the actual exam.

Upon completion and understanding of the study of various techniques of integration (in particular- integration by parts, partial fractions, trig integrals, and the substitution), future uses of integration often occur as part of the solution to a larger exercise in other courses in Science and Engineering. It then becomes important to quickly and accurately get the integration done so that the larger problem can be solved. Toward this end, extensive tables of integral formulae (CRC Mathematical tables) are often used. In order to aid in the search for the appropriate integral formula, various types of integrals are grouped together according to similarities in the integrand. We can illustrate how this works using the brief table of integrals at the very back of the text (T-1/T-6).

Example:

Integrate the following: $\int \frac{dx}{x\sqrt{2x+4}}$

Solution:

Instead of trying to determine which technique of integration to use (in this case, first make the substitution $u = (2x + 4)^{\frac{1}{2}}$, then use partial fractions), we use formula 13 (b) with $a = 2$ and $b = 4$.

This gives $\int \frac{dx}{x\sqrt{2x+4}} = \frac{1}{2} \ln \left| \frac{\sqrt{2x+4}-2}{\sqrt{2x+4}+2} \right| + c.$

Evaluate the following integrals using the brief table of integrals in the text. Indicate which technique of integration would be used and which integral formula you used.

Problem 1: $\int \frac{\sqrt{x^2-4}}{x} dx$

Problem 2: $\int x\sqrt{4x-x^2} dx$

Problem 3: $\int x^2 \cos 3x dx$

Problem 4: $\int e^{2x} \cos 3x dx$

Problem 5: $\int x \sin^{-1} 2x dx$

Problem 6: $\int \frac{dx}{(1-x^2)^2}$