### **Assignment**

Your second lab project consists of all ten questions from the back of this page. Each question is worth 3 points.

### **Collaboration**

You may work with others, but each student should submit a separately written project report. At the end of your report, you should list all of your collaborators. Simply copying another's work and calling it your own, or not giving credit to collaborators, is considered plagiarism and will be dealt with according to University regulations.

#### What makes a good report?

Your final report for each project should have a clear and complete presentation of the project material. Each report will generally consist of paragraphs of text interspersed between various Maple commands, plots, and other output. All text should be written with complete sentences using proper grammar and correct spelling. A part of your grade will be based upon the clarity of your presentation. When proofreading your report, check to see if you are omitting important details or illustrative plots. Also check to see if you are including too many unnecessary details. Hand in work that you are proud to claim as your own.

In particular, do not simply turn in a Maple worksheet with a bunch of input and output. It is not the TA's job to figure out how your Maple output answers the various questions. It is your job to submit an easy-to-read project report. You may use pencil and paper, Microsoft Word with bits of output copied from Maple, Maple with text regions, or any other format which allows you to submit a clearly written report. Note also that you are not required to use Maple for all parts of your project. Some work is more easily done by hand.

## Submit project reports to your Lab TA (due Wed., Feb. 25 by 5:00 PM)

Sections 1 – 3 with Prof. DixLab TA:Qi WuContact Info:wuq@math.sc.edu, LC 107B, 576-5948, mailbox for Wu, Qi by LC 411

Sections 4 – 6 with Mr. MurphyLab TA:Elizabeth PerezContact Info:pereze@math.sc.edu, LC107B, 576-5948, mailbox for Perez by LC 411

<u>Sections 7 – 9 with Prof. Bennett</u> Lab TA: Luke Owens Contact Info: <u>owensl@math.sc.edu</u>, LC B004, 777-4674, mailbox for <u>Owens, L</u> by LC 411

# Maple and Integration

Use Maple to check the correctness of each of the following integrals. Each integral comes from Varberg, Purcell, and Rigdon (8<sup>th</sup> edition). The specific problem is identified, and the given value of the integral is taken from the solutions provided at the back of the book.

#### One of the listed answers is wrong!

Your first objective is to determine the incorrect equation. Once you identify the incorrect equation, explain how you determined this equation is incorrect and provide the correct value for this integral. For each of the *other* integrals, use Maple to assist with the derivation of the stated value of the integral.

- Deriving the value of the integral is different from verifying that each formula is correct. One of the first steps in the derivation **must** involve the use of the Maple command for integration (int or Int).
- Once Maple's value for the integral is obtained, show all of the steps needed to transform this result into the given value for the integral.
- In some cases it might be possible to use Maple to complete the derivation, e.g., the simplify or factor commands.
- In other cases, for example, one or more trigonometric identities might be required. State each identity and show how it leads to (or towards) the desired final expression.
- Remember that Maple's integration commands do not automatically include the constant of integration (+C). Add this manually in Maple, or simply insert an appropriate constant in your written response.
- Maple uses a definition of the natural logarithm function for which it is correct to write  $\int \frac{dx}{x} = \ln(x) + C$ . For our purposes, we must remember to replace Maple  $\ln(x)$  with  $\ln |x|$ .

$$\begin{array}{ll} (1) & [\$8.2 \ \#19] \int \tan^3 x \ dx = \frac{1}{2} \tan^2 x + \ln |\cos x| + C \\ (2) & [\$8.2 \ \#25] \int \tan^3 x \sec^2 x \ dx = \frac{1}{4} \sec^4 x - \frac{1}{2} \sec^2 x + C \\ (3) & [\$8.4 \ \#3] \int te^{5t+\pi} \ dt = \frac{1}{5} te^{5t+\pi} - \frac{1}{25} e^{5t+\pi} + C \\ (4) & [\$8.4 \ \#49] \int \sin(\ln x) \ dx = \frac{x}{2} (\sin(\ln x) - \cos(\ln x)) + C \\ (5) & [\$8.2 \ \#3] \int \sin^3 x \ dx = -\cos x + \frac{1}{3} \cos^3 x + C \\ (6) & [\$8.4 \ \#39] \int x2^x \ dx = \frac{x}{\ln 2} 2^x - \frac{1}{(\ln 2)^2} 2^x + C \\ (7) & [\$8.2 \ \#1] \int \sin^2 x \ dx = \frac{1}{2} x - \frac{1}{4} \sin 2x + C \\ (8) & [\$8.1 \ \#5] \int \frac{dx}{x^2+4} = \frac{1}{12} \tan^{-1} \left(\frac{x}{2}\right) + C \\ (9) & [\$8.4 \ \#9] \int t\sqrt{t+1} \ dt = \frac{2}{3} t(t+1)^{3/2} - \frac{4}{15} (t+1)^{5/2} + C \\ (10) & [\$8.5 \ \#37] \int \frac{2x^3 + 5x^2 + 16x}{x^5 + 8x^3 + 16x} \ dx = \frac{3}{2} \tan^{-1} \left(\frac{x}{2}\right) + \frac{2x-5}{2(x^2+4)} + C \end{array}$$