

The University of British Columbia
Sessional Examinations — April 2009

MATHEMATICS 210 SEC. 201
INTRODUCTION TO MATHEMATICAL COMPUTING

Instructor: R. Israel

Time: 2 1/2 hours

Instructions: All paper and online references are allowed (anything except people). You may use a web browser, but not email or instant messaging.

You can use either of the Windows 2000 servers available from your terminal. If you see a login screen for something other than Windows 2000, press `Ctrl \`. Place your full name and student number at the beginning of the worksheet.

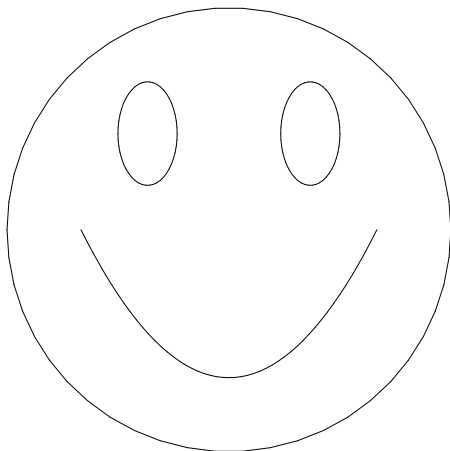
Be sure to save your work frequently. You may wish to have two Maple windows open, one for “scratch work” and one for the “good copy”, to which you can copy and paste Maple commands from the other window when you know that they work. This may save you from losing your work due to Maple crashing.

Include commentary in English about what you are doing and what conclusions you draw from the results, as well as the Maple code itself.

To submit your work, save your worksheet file to the desktop (with a name that contains your login name), then click on **My Computer** (near the top left of the desktop), open the **SHARE** folder there and the **Math 210** folder in **SHARE**, and copy your file in to the **Math 210** folder. You will not be able to remove a file from that folder once it's in there, but you can submit another file (with a different name). Thus if your login name is **adam** you could submit **adam1.mw** and then later **adam2.mw**, and **adam2.mw** will be the one that I mark.

You can check with me to make sure your file has been submitted.

- [20] 1. Produce a plot in Maple that looks like this:



Commands in the `plots` and `plottools` packages may be used.

- [21] 2(a). Find a polynomial $p(x)$ such that $p(n) = a_n$ for n from 1 to 8, where a_n is the n 'th digit in your student number.

(b). Plot $p(x)$ (from part (a)) for $1 \leq x \leq 8$ together with the eight points (n, a_n) , showing only the part of the graph for $0 \leq y \leq 10$.

- [12] 3. Use a change of variables to transform $\int_0^\infty \frac{dx}{\sqrt{1+e^x}}$ into the integral of a smooth function over a finite interval.

- [12] 4. Use the methods of the last part of Lesson 17 to find

$$\int \frac{x+1}{(x^2+1)x^2} dx$$

- [20] 5. Find, with error at most 10^{-4} , $\sum_{k=1}^{\infty} \frac{\ln(k)}{1+k^{3/2}}$ by using upper and lower bounds on the tail of this series.

- [15] 6. Find a continued fraction that approximates the function $f(x) = \sin(x)$ on the interval $-1 \leq x \leq 1$ with maximum error at most 10^{-4} .

[100] Total marks