MATH 113 – MAPLE ASSIGNMENT 5 – DUE 3 MAY 2007

Answer all of the following questions. You may work in groups of no more than three persons to complete this assignment. One copy of the completed assignment is to be turned in for each group. **Each member of the group must sign the assignment.**

You are expected to turn in a printout of a MAPLE worksheet containing the MAPLE commands and output that you used to complete the assignment. You must also include text explaining what you are doing (this can be typed onto the MAPLE worksheet or written by hand on the printout). Include any hand calculations.

This assignment is due at the beginning of class on Thursday 3 May 2007. No late assignments will be accepted under any circumstances whatsoever. If you are not finished with the assignment by the due date, you should turn in what you have for partial credit. You may turn in the assignment early if you wish.

1. In this problem, we will estimate the value of the definite integral $\int_0^1 \sin(\pi x^2)\,\cos(\pi x^2)\,dx$ by approximating the area under the curve with rectangles.

   (a) (5 pts.) Plot the integrand $\sin(\pi x^2)\,\cos(\pi x^2)$ using the horizontal viewing window `x=0..1`. Use the `leftbox` and `rightbox` commands in MAPLE to display rectangular approximations to the area under the curve using the left and right endpoints of n equal subintervals of $[0, 1]$ with $n = 2$, 4, and 10. (Note: Be sure to type `with(student);` at the MAPLE prompt to load the needed macros into MAPLE.)

   (b) (5 pts.) Use the MAPLE commands `rightsum` and `leftsum` to obtain estimates of the value of the integral using each of the rectangular approximations you found in part (a). Use MAPLE's `int` command to find the value of the integral accurate to 10 decimal places.

2. This problem will explore further the use of MAPLE's `int` command.

   (a) (5 pts.) Verify by hand or by using MAPLE that the function $F(x) = (x^2 + 1)^4$ is an antiderivative of the function $f(x) = 8x(x^2 + 1)^3$. Use the MAPLE `int` command to find an antiderivative of $f(x) = 8x(x^2 + 1)^3$. The correct syntax is

   ```
   int(8*x*(x^2+1)^3,x)
   ```

   (c) (5 pts.) Define a function $G(x)$ to be the antiderivative you found in part (a). (You may have to retype or cut and paste the result of the `int` command.) Plot the function $G(x)$ you found in part (b) and the function $F(x)$ given in part (a) on the same set of axes using the viewing window `x=-0.5..0.5, y=0..2`. Why are the graphs different?