Calculus I – Technology Exercises

Create the following documents and email them to the instructor at james@richland.edu before the exam over that material. These projects may be worked in pairs. Submit one document per team with both names on it. You may not work with the same partner for these technology projects more than twice. You may work alone only once.

There are example solutions on the website. You must use different problems than the examples. When asked to create a problem, you should not use one from the textbook.

Chapter 1 – Limits

There will be two files for this project. One will be a Word document containing the Winplot graphs and the Excel table. The other will be a labeled Maxima file. Create an answer key at the end of the Word document for questions 1 and 2.

1. Use Winplot to create a problem similar to 1.2.26 and ask at least 10 questions about the graph. Use your own functions, but cover the topics of continuity, one-sided limits, two sided limits, and infinite limits. Note that some of the topics are not covered until later in the chapter.
2. Use Excel to create three problems similar to 1.2.1-8. One of the problems should have the same limit from both sides. One of the problems should have an infinite limit. One of problems should have a two-sided limit that does not exist.
3. Use the **limit** command in Maxima to answer questions 8, 12, 14, 22, and 26 from section 1.4. Annotate the output.

Chapter 2 – Derivatives

There will be two files for this project. One will be a Word document containing the Winplot graphs. The other will be a labeled Maxima file.

1. Use Winplot to create a matching type problem similar to questions 2.1.39-42. Create the graphs of four functions and the graphs of four derivatives and copy them into Word. Include an answer key at the end of the document.
2. Use the **diff** command in Maxima to answer questions 2.2.50, 2.3.56, 2.3.58, 2.4.92, 2.4.100, 2.5.10, and 2.5.32. Annotate the Maxima file.

Chapter 3 – Applications of Differentiation

There will be two files for this project. One will be a Word document containing the Winplot graph and the Excel output. The other will be a labeled Maxima file.

1. Use Winplot to create a graph that will illustrate the mean value theorem. Use

Maxima to help with the algebra. The graph should look something like figure 3.12, but use a concrete example like 3.2.39-48.
2. Use Maxima to answer questions 3.4.44 and 3.6.34. Annotate the file.
3. Use Excel to solve problem 3.8.18. Iterate until consecutive approximations are equivalent. Copy and paste the output into your Word document.

Chapter 4 – Integration

There will be two files for this project. One will be a Word document containing the Winplot graphs and output. The other will be a labeled Maxima file.

1. Use Winplot to sketch a slope field and two points (not on the same curve). In the answer key section, include another graph the solution curves drawn through the points. This is similar to 4.1.51-54.
2. Use the **integrate** command Maxima to solve problems 4.4.16, 4.4.26, 4.5.26, and 4.6.38. Annotate the file.
3. Use Winplot to complete the table for question 4.6.44. Do not write the program as directed to in exercise 41. Make a table in Word and fill it by retyping the numbers from Winplot. *Note: Winplot calls the Simpson method parabolic and lets n represent the number of parabolas, which is half the number of sub-intervals. That is, to get the value for n=8 sub intervals, you need to enter 4 into Winplot. The other methods need no adjustment.*

Chapter 7 – Applications of Integration

There will be two files for this project. One will be a labeled Maxima file with everything except for the graph of the region. The other file will be a Winplot *.wp2 file of the region.

1. Describe a region completely within the first quadrant that does not intersect the line $3x + y = 5$. The top and bottom functions should be functions of *x* while the left and right sides should be constants. Use Winplot to graph the region.
2. Find the area of the region.
3. Find the volume of the solid generated when the region is rotated about the *x* axis.
4. Find the volume of the solid generated when the region is rotated about the *y* axis.
5. Find the volume of the solid generated when the region is rotated about $x = -3$.
6. Find the perimeter of the region.
7. Find the centroid of the region.
8. Use the Theorem of Pappus to find the volume of the solid generated when the region is rotated about the line $3x + y = 5$.
9. Find the area of the surface generated when the top curve is rotated about the *x* axis.