Mathematics 251: Lab 0 **INTRODUCTION TO MAPLE**

This lab is intended to introduce you to some of the basic features of Maple and to give you practice preparing a Maple worksheet. Most of the information you need to do this lab is contained in the handout **Instructions for Use of Maple in Mathematics 251**. You can also learn more about the relevant Maple commands by using the **Help** feature of Maple described in that document. Although this lab is for practice only, it is important that you learn how to prepare your Maple worksheet in the way you will be asked to do it in future assignments on which you will be graded. Be sure to include explicit answers to all questions asked, using the **text** feature of Maple to insert them in the worksheet (don't write them by hand). Insert graphs directly into your worksheet and use the editing capabilities of Maple to remove from the worksheet any extraneous material such as any errors you have made.

1. Use Maple's `evalf` command to evaluate the fraction $4/7$ to 20 decimal places.

2. Use Maple's `simplify` command to combine $a + b - 2ab/(a + b)$ into one fraction.

3. Let $p = (x + 1)(x^2 + 2)^3 + 4x$. Do the following: First define a Maple expression for p and then use Maple's `factor` command to factor p^4. Then solve $p^4 = 2$ for x. First try the `solve` command. Then try the `fsolve` command. Finally, to get all the roots, use the `complex` option of the `fsolve` command.

4. Use Maple's `plot` command to determine if the function x^x has any local maxima or minima on the interval $0 < x \leq 4$. Use the **text** feature of Maple to place a statement in your Maple worksheet stating your findings. Then place a plot which supports your findings in your Maple worksheet.

5. Plot the functions x, x^2, and x^3 on the same set of axes for $0 \leq x \leq 1$. Place the plot in your Maple worksheet. Place a label below the plot describing what it is.

6. Find the first and second derivatives of the function $g(x) = \sin(x^2)$. (First define an expression for g and then use Maple's `diff` command.)

7. Use Maple's `fsolve` command to find a root of the function $f(x) = x - \cos x$ in the interval $0 \leq x \leq 1$. Check that your answer is reasonable by obtaining a plot of f.

8. Use Maple's `int` command to find $\int x^2 \ln(x)\, dx$.

9. Maple does numerical integration by combining the `evalf` and `Int` commands. Use these commands to find $\int_0^1 \sqrt{1 + x^4}\, dx$.

10. Maple's `plot` command can also be used to plot parametric equations, i.e., equations of the form

$$x(t) = 9\cos(t) - \cos(9t), \qquad y(t) = 9\sin(t) - \sin(9t)$$

Use this feature to plot the above for $0 \leq t \leq 2\pi$ and place the plot in your Maple worksheet.

11. To obtain three-dimensional plots it is first necessary to issue the Maple command `with plots:`. Then use the Maple command `plot3d` to obtain a plot of the function $z = 5 - x^2 - y^2$ over the range $-3 \leq x \leq 3$, $-3 \leq y \leq 3$. Place the plot in your Maple worksheet.