# Math 235: Maple Homework Sheet

Maple can be used as a tool to assist in the completion of exercises that rely heavily on symbolic manipulation and visualization. The purpose of today's exercises is to learn the basics of Maple.

You should work in groups of two or three **with each name listed on the worksheet** (and each person submits a copy of the worksheet).

The first problem is done for you (on the worksheet) as an example.

1. Consider the function
$$f(x) = \sqrt{\frac{x^4 - x + 1}{x^4 + x + 1}}$$
   (a) Use Maple to differentiate and simplify the result.
   (b) Graph $f$ and $f'$ on the same axes.

2. Biologists have observed that the chirping rate of crickets of a certain species appears to be related to temperature. The table below shows the chirping rates for various temperatures.

| Temp | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|---|---|---|---|---|---|---|---|---|---|
| Chirps/min | 20 | 46 | 79 | 91 | 113 | 140 | 173 | 198 | 211 |

   (a) Make a scatter plot of the data.
   (b) Find and graph the line of best fit, $y = a + bt$.
   (c) Use the line of best fit to estimate the chirp rate at 100°F

3. (a) Draw the graph of $f(x) = \cos(x^2)$ in the viewing rectangle $[0, 2]$ by $[-1.25, 1.25]$.
   (b) If we define a new function $g$ by:
$$g(x) = \int_0^x \cos(t^2)\, dt$$
   What does $g(x)$ represent (graphically)? (In Maple, define $g$ as a function, then answer the question using regular text).
   (c) Use Maple to differentiate $g$, then plot $g, g'$ on the same axes, $x \in [-1, 2]$.

4. (a) Use the Maple help files to define $\sinh(x), \cosh(x)$. Use the example in the help file to convert the hyperbolic tangent to exponential form.
   (b) By graphing them together, show that $\sinh(x)$ is odd and $\cosh(x)$ is even.
   (c) Show, using Maple, that
$$\int \frac{dx}{\sqrt{x^2 - 4}} = \ln|x + \sqrt{x^2 - 4}| + C_1 = \cosh(x/2) + C_2$$
   You can show this algebraically or graphically- your choice.

5. Find the Maclaurin series for $e^{-x^2}$ to order 6 (that is, $x^6$ would be your last term in the series). Plot the function together with the approximation.

   *Maple Notes:*

   In your worksheet, type `with(Student[Calculus1]);` then find the Taylor approximations under `Tools`, then `Tutors`, then keep going until you find it!