This laboratory should give students practical experience with some of the basic, but often used, mathematica functions and graphics capabilities. It will also demonstrate how to use numerical computation when closed form expressions cannot be obtained.

$\overline{\qquad\qquad\qquad\qquad}$ TASKS $\overline{\qquad\qquad\qquad\qquad}$

Integrating and Simplifying Expressions

1. Use Mathematica to calculate an expression for Cheddar, where

$$\text{Cheddar} = \int \sqrt{\frac{1}{1 + 2x + x^2}}\, dx$$

   Try to simplify the form of the expression. Does the expression seem as simple as it should be?

2. Verify that your expression is correct by taking a derivative of Cheddar.

3. Use **Simplify** and the additional assumption that x is a real number ($x \in$ Reals). Name this result RealCheddar.

4. By integrating over the finite domain $x \in (0, y)$ where $y > 0$, show that

$$\text{Colby} = \int_0^y \sqrt{\frac{1}{1 + 2x + x^2}}\, dx$$

   is the same function as Cheddar.

5. Plot Colby for $0 < y < 10$.

6. To generalize the above, consider the values of the definite integral over the unit domain:

$$\text{Cheese} = \int_0^b \sqrt{\frac{1}{a^2 + 2ax + x^2}}\, dx$$

   where $a > 0$ and $b > 0$.

7. Plot the surface Cheese for $0 < a < 3$ and $0 < b < 3$.

8. Plot 50 contours of constant value of Cheese within $1 < a < 2$ and $1 < b < 2$.

Save your Work Save your work as a mathematica notebook: `3016_Lastname_Lab02.nb`.

$\overline{\qquad\qquad\qquad\qquad}$ REPORT $\overline{\qquad\qquad\qquad\qquad}$

This homework will be graded. Your report on the work above should be ordered as it is above. Your report should include comments that would help one of your classmates understand what your work demonstrates. Send your report as a saved Mathematica notebook with name `3016_Lastname_Lab02.nb` to 3016-labreports@pruffle.mit.edu. As the subject use "3.016 Lab 02 LASTNAME".