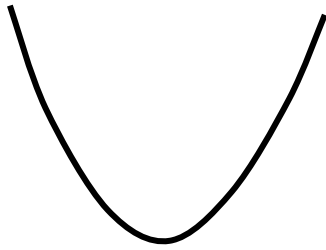
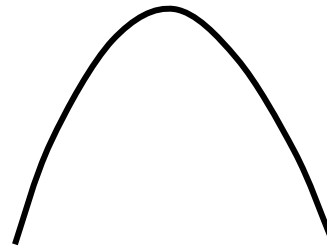


Concavity

In this laboratory assignment you will study the concavity of a function and how it relates to the first and second derivatives. See the figures drawn below which illustrate the terms concave upward and concave downward.



concave upward



concave downward

An informal way of remembering the two shapes is that concave upward resembles a coffee cup sitting right-side-up. Concave downward resembles a coffee cup placed upside-down.

Listed below are several functions which you are to study on StudyWorks.

$$y = \cos(x)$$

$$y = \log(x)$$

$$y = x^4 - 2x^2$$

$$y = \frac{3}{5}x^3 - x^2$$

$$y = 3x - 4\sqrt[3]{x} \quad (\text{Be sure to enter this in radical form. Do not convert to a fractional exponent.})$$

1. Load the StudyWorks template from the file C-LAB-3.MCD. (*My Computer Local Disk (c:) Studywks Ahlborn-Studyworks C-LAB-3.MCD*)

2. For each function above:
 - a. Type the function next to $f(x):=$ on the template. Press F9 to calculate the worksheet.
 - b. Look at the graph and the tables.
 - c. State the intervals over which the graph of the function appears concave upward or downward.
 - d. At what points does the function appear to change from concave upward to concave downward?
 - e. Now examine the table of values for f'' . What patterns do you see? What relationship is there between the concavity of the function and the sign (positive/negative) of f'' ? What values does f'' take on at the points where the concavity of f changes.?
 - f. Make a printed copy of any one of the worksheets.

3. Prepare a written report which includes each of the following:
 - a. This assignment paper as a cover to the report. Please fill in your name(s) and the due date. If you had a partner but are turning in separate reports, put the partner's name in parentheses.
 - b. An introductory paragraph about the nature and purpose of the assignment.
 - c. Answers to questions 2.c, d., and e. for each function.
 - d. A summary of your results, interpretations, and conclusions.
 - e. Discussion of the following:
 - i. How can you use f'' to determine the concavity of a function (in the absence of a graph)?
 - ii. How can knowing the values of f'' help locate the points at which the concavity of the function changes?
 - f. A print-out of a completed StudyWorks template from any one of the functions you choose.