

LAB C: GRAPHS OF FUNCTIONS: SHIFTING AND SCALING

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Overview

There are two objectives in this lab:

- learn to enter mathematical expressions in Maple and
- recognize translations and scalings of common mathematical functions.

Maple Essentials

- The *Standard Functions* maplet is started from the Maple 9.5 user interface under the **Tools** menu:
 - **Tools** → **Tutors** → **PreCalculus** → **Standard Functions** . . .
- The *Shift* maplet is started from the course website:
 - www.math.sc.edu/~sanders/141L-S05/labs/ → [Shift\(TAMU\)](#)

Preparation

Review pages 31-33 in your textbook about translations of graphs.

Maple Syntax

<u>Basic Function</u>	<u>Maple Syntax</u>
$f(x) = x^2$	x^2
$f(x) = \sqrt{x}$	<code>sqrt(x)</code>
$f(x) = \frac{1}{x}$	<code>1/x</code>
$f(x) = x $	<code>abs(x)</code>

Activities

- (1) Log in and Start a Maple session.
- (2) Launch the *Standard Functions* tutor.
- (3) You should see the following parameters.

<u>Parameter</u>	<u>Meaning/Effect</u>
$f(x)$	Basic Function
a	Vertical Stretch or Compression
b	Horizontal Stretch or Compression
c	Horizontal Shift
d	Vertical Shift

- (4) We will do the first example together.

- (5) Use Maple to get a graph of $y = \frac{1}{2}(x - 3)^2 + 2$.
- From the list of Basic Functions, we choose $f(x) = x^2$.
 - We have a vertical compression: $a = 1/2$.
 - We do not have a horizontal stretch or compression: $b = 1$.
 - We have a horizontal shift: $c = -3$.
 - We have a vertical shift: $d = 2$.
 - Once you have changed each of these, click **Display**.
 - The graph in red is $f(x) = x^2$. The graph in blue is ours.
- (6) Use Maple to get graphs of each of the following.
- $y = 1 + \sqrt{x - 4}$
 - $y = |x + 2| - 2$
 - $y = 2 - \frac{1}{x+1}$
 - $y = x^2 + 6x - 10$ *You must first rewrite in the standard form of a parabola.*
 - $y = \frac{x-1}{x}$ *You must also find a way to rewrite this one.*
- (7) Start the *Shift* maplet.
- (8) Click on **Show 7 Basic Functions**.
- (9) Review these 7 functions one at a time until you recognize each of them.
- (10) Close the Basic Functions window and click **Show Shifted Graph**.
- (11) Using Maple syntax, write the equation of the shifted graph in the space provided. Click **Check Answer**.
- (12) If you are correct, the graph will turn green. If you are incorrect, your answer will be displayed in red, and you should try again.
- (13) Work with this maplet until you are proficient at identifying the seven basic functions and their shifts.
- (14) Remember to logout.

Assignment

Your assignment for this week is to complete this lab if you did not have the opportunity in your lab period. This material will be included on Maple Quiz 1.