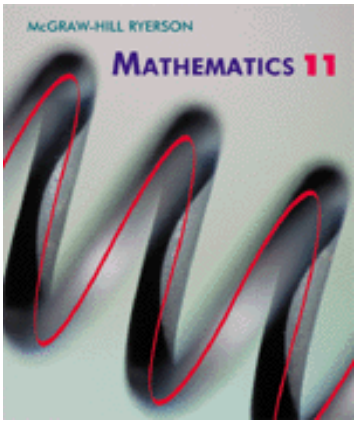
Fathom™ Tutorial

Dynamic Statistical Software

designed for teachers using

McGraw-Hill Ryerson
Mathematics 11

©2002 McGraw-Hill Ryerson Limited



by Roland W. Meisel
Version 1.1 2004-07-27

Please Return This Guide to the Presenter at the End of the Workshop

if you would like an electronic copy of this guide, please send email to:

rollym@vaxxine.com

Thank you!

Foreword

This tutorial is designed for the teacher who wants to use the power of Fathom™ to teach the Grade 11 Mathematics MCR3U or MCF3M courses. Although Fathom™ was designed as a statistical program, it contains powerful function plotting capabilities. This tutorial is keyed to the *McGraw-Hill Ryerson Mathematics 11* text, © 2001, McGraw-Hill Ryerson Limited. Several applications of Fathom™ are included in this tutorial. Step-by-step keystroke instructions and liberal use of screen shots will ease the novice along the learning curve for this powerful new technology. The user will find it helpful to follow through the text as he or she works through this tutorial. By working through the tutorial, the user will gain a solid knowledge of Fathom™ as applied to these courses.

About Fathom™

Fathom™ is a powerful dynamic statistical software package published by

An excellent web site, with Fathom™ resources and links to other web sites, is at **www.keypress.com**.

Introduction:

Fathom™ is a statistics software package that offers a variety of powerful data analysis tools in an easy-to-use format. This section introduces basic features of Fathom. A complete guide is available on the Fathom™ CD. The real power of this software will be demonstrated in later chapters with examples that apply its sophisticated tools to statistical analysis and simulations.

When you enter data into Fathom™, it creates a **collection**, an object that contains the data. Fathom™ can then use the data from the collection to produce other objects, such as a **graph**, **table**, or **statistical test**. These secondary objects display and analyse the data from the collection, but they do not actually contain the data themselves. If you delete a graph, table, or statistical test, the data still remains in the collection.

Fathom™ considers a collection as a set of **cases**. Each case in a collection can have a number of **attributes**. For example, the **cases** in a **collection** of medical records could have **attributes** such as the patient's name, age, sex, height, weight, blood pressure, and so on. There are two basic types of attributes, **categorical** (such as male/female) and **continuous** (such as height or weight). The **case table** feature displays the cases in a collection in a format similar to a spreadsheet, with a row for each case and a column for each attribute. You can add, modify, and delete cases using a case table.

Horizontal and Vertical Transformations of Functions — Page 188 MHR M11

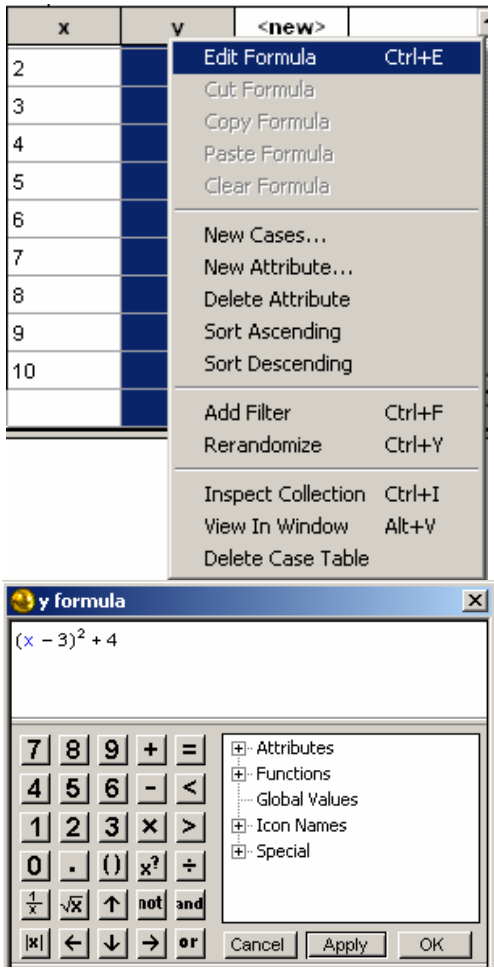
Example 4 Horizontal and Vertical Translations

Sketch the graph of $y = (x - 3)^2 + 4$

Solution

Launch Fathom™ and drag the **case table** icon from the shelf to the workspace. Click on the attribute **<new>**, type the heading **x**, and press **Enter**. Repeat the process to create an attribute column for **y**. Note that your collection has been given the generic name **Collection 1**. You can double-click on the collection box and change the name to something more descriptive, such as **Graphing Functions**. Although it is not necessary to actually put values in the case table in order to graph the function, this is a good place to do so. Enter values for the **x** attribute from –10 to 10 in increments of 1. Right-click on the heading of the **y** attribute columns, and select **Edit Formula**. Enter the formula $(x - 3)^2 + 4$. Click **Apply**, and then **OK**.

When you are finished, your **case table** will look like the following screen shot.



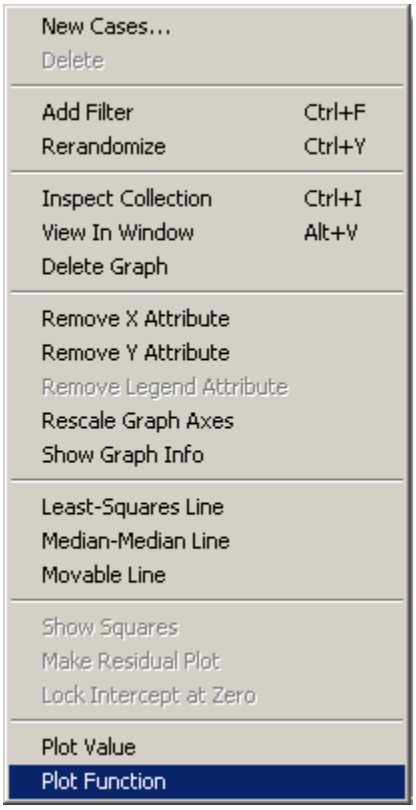
Drag the graph icon  to the workspace.

Drag the **x** attribute from the **case table** to the horizontal axis of the graph. Drag the **y** attribute to the vertical axis of the graph. You can drag the numbers on the axes to adjust the origin and the scales.

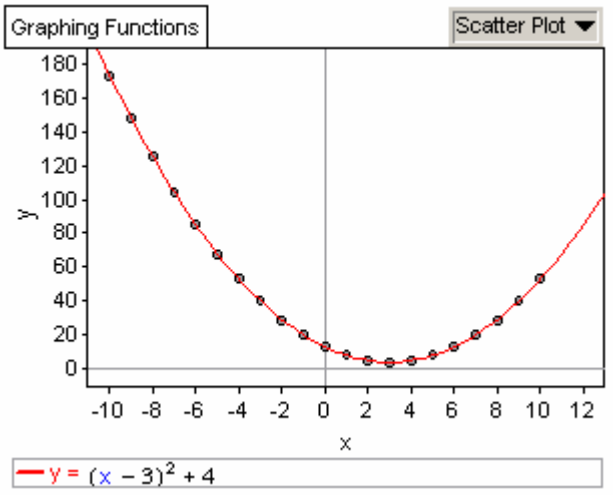
Note that the graph is a dot plot. To obtain a continuous plot, ensure that the graph is selected. Right-click on the graph, and select **Plot Function**.

Graphing Functions

	x	y
13	2	5
14	3	4
15	4	5
16	5	8
17	6	13
18	7	20
19	8	29
20	9	40
21	10	53



The expression editor will appear. Enter the expression $(x-3)^2 + 4$ as before. Click on **Apply**, and then **OK**. The function will be plotted, as shown in the screen shot below. This plot could have been made without entering any data in the case table. Note that the function is displayed below the graph.



So far, you have simply used Fathom™ as a function plotter. Now you will see how to take advantage of the dynamic nature of Fathom™ to illustrate the processes of translation.

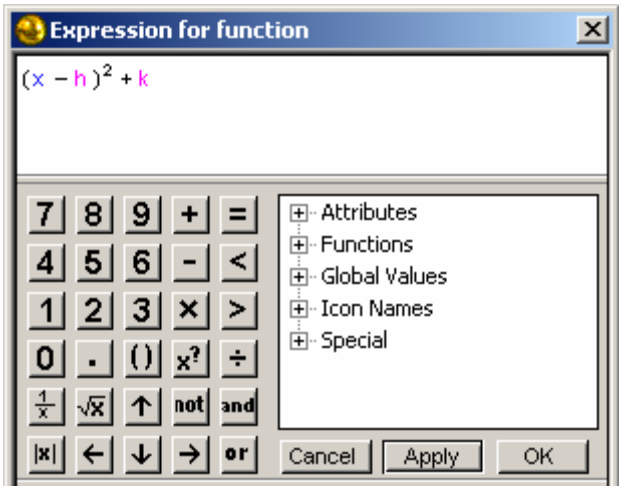
The function in this example is a translation of the function $y = x^2$. Plot this function, and use sliders to do the translations.

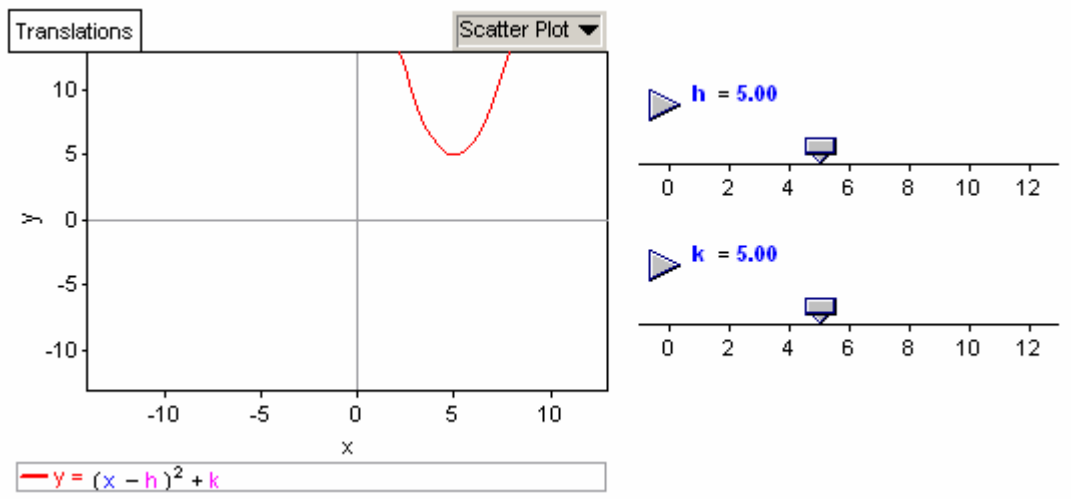
Close the current file and open a new file. Drag the **case table** icon from the shelf to the workspace. Click on the attribute **<new>**, type the heading **x**, and press **Enter**. Repeat the process to create an attribute column for **y**. Change the name of the collection to **Translations**.

Drag the graph icon to the workspace. Drag the **x** attribute from the **case table** to the horizontal axis of the graph. Drag the **y** attribute to the vertical axis of the graph. Drag the numbers on the axes to adjust the origin and the scales.

Drag a slider from the shelf to the workspace. A slider is given a default "V" name. Click on the "V" name, and rename the slider **h**. Drag another slider to the workspace and rename it **k**. You will use these sliders to control the horizontal and vertical translation.

Right-click on the graph, and select **Plot Function**. The expression editor will appear. Enter the expression $(x - h)^2 + k$. Click on **Apply**, and then **OK**. If necessary, adjust the axes. The graph should appear much like the one shown in the screen shot.





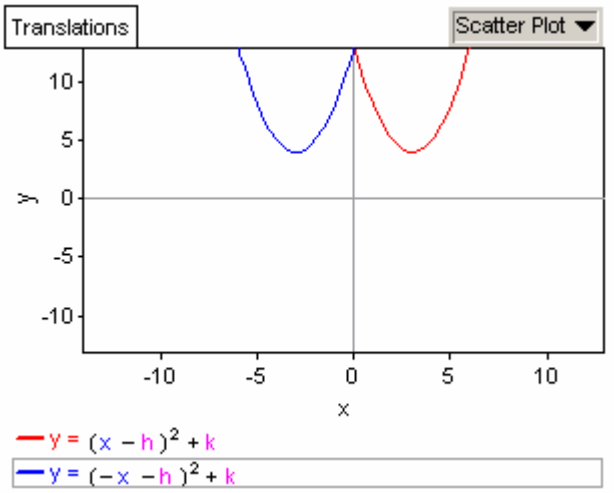
Use the sliders to adjust the horizontal and vertical translations in real time. You can change the scale of each slider by dragging the numbers in the scale. Change the scale to include some negative numbers.

Reflections of Functions

Page 194 MHR M11

Reflections

Adjust h to a value of 3 and k to a value of 4. Right-click on the graph, and add a second formula as shown in the screen shot below. This represents a reflection in the *y*-axis. Use the sliders to see the effect to translating the original graph. Note that the reflection moves along with the original function in an appropriate manner.



Extension

Add the equation for a reflection about the *x*-axis.

Inverse of a Linear Function

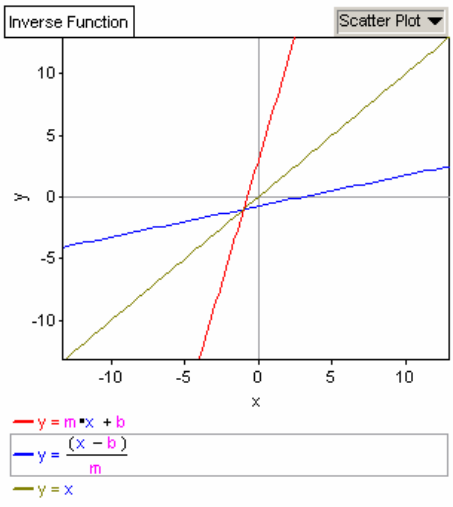
Page 211 MHR M11

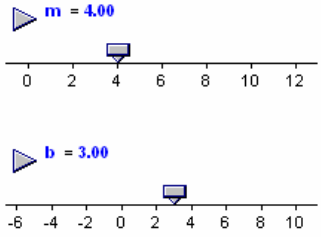
Example 2

Find the inverse of the function $f(x) = 4x + 3$.

Solution

Open a new file. Drag the **case table** icon from the shelf to the workspace. Click on the attribute **<new>**, type the heading **x**, and press **Enter**. Repeat the process to create an attribute column for **y**. Change the name of the collection to **Inverse**.Drag the graph icon to the workspace. Drag the **x** attribute from the **case table** to the horizontal axis of the graph. Drag the **y** attribute to the vertical axis of the graph. Drag the numbers on the axes to adjust the origin and the scales. Adjust the aspect ratio of the graph until the axes appear to have the same scale.Drag a slider from the shelf to the workspace. Click on the "V" name, and rename the slider **m**. Drag another slider to the workspace and rename it **b**. You will use these sliders to control the slope and intercept of the function. Right-click on the graph, and select **Plot Function**. The expression editor will appear. Enter the expression m*x* + b. Click on **Apply**, and then **OK**. In a similar fashion, plot the functions $y = \frac{x - b}{m}$ and $y = x$. When you are finished, your graph should look like the screen shot at the right. Use the sliders to adjust the slope and *y*-intercept of the line. Note how the inverse function changes.





Extension

Use Fathom™ to illustrate the quadratic function $y = x^2$ and its inverse.

Transformations of Trigonometric Functions

Page 383 MHR M11

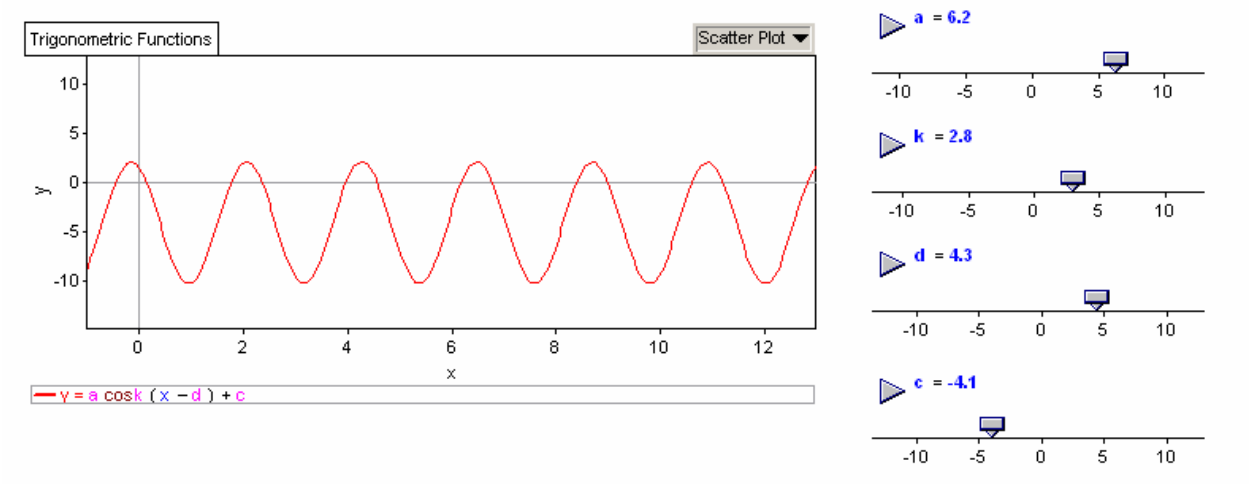
Example 4

Use Fathom™ to illustrate the graph of the function $y = a\cos k(x - d) + c$.

Solution

Open a new file. Drag the **case table** icon from the shelf to the workspace. Click on the attribute **<new>**, type the heading **x**, and press **Enter**. Repeat the process to create an attribute column for **y**. Change the name of the collection to **Trigonometric Functions**.Drag the graph icon to the workspace. Drag the **x** attribute from the **case table** to the horizontal axis of the graph. Drag the **y** attribute to the vertical axis of the graph. Drag a slider from the shelf to the workspace. Click on the "V" name, and rename the slider **a**. Create other sliders for **k**, **d**, and **c**.

Right-click on the graph, and select **Plot Function**. The expression editor will appear. Enter the expression $y = a\cos k(x - d) + c$. Click on **Apply**, and then **OK.** Use the four sliders to investigate the effect of each of the parameters on the graph. Adjust the scale of each slider as needed. Adjust the axes and aspect ratio of the graph to produce an appropriate appearance, similar to that shown below.



This concludes this Fathom™ Tutorial.

For additional Fathom™ resources, visit the Key Curriculum Press web site at www.keypress.com.