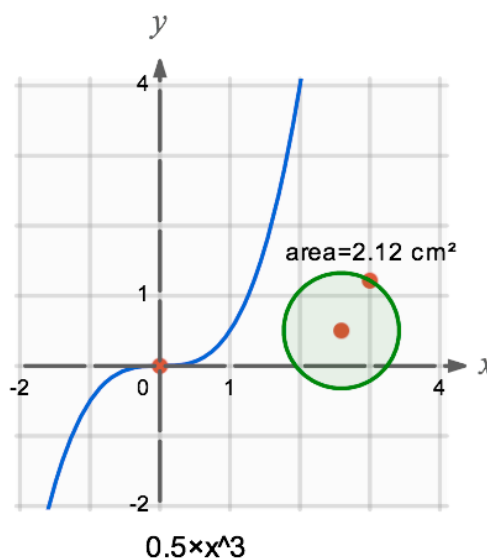


## GRIDS, AXES AND GRAPHS

Grids and axes allow functions to be graphed.

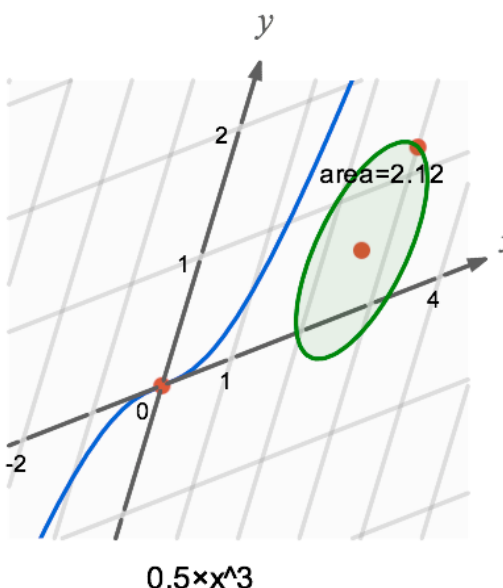
The graph of  $y = 0.5x^3$  is shown here.

See Cabri Author file ***gridsaxesgraphs*** page 1.



Objects may also be created that depend on a coordinate system rather than the underlying plane.

Notice how the location and shape (but not the area) of the circle depend on the orientation and scale of the axes.

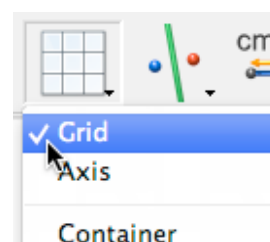


### 1. GRIDS AND COORDINATE SYSTEMS

#### 1.1 Creating a coordinate system region

See pages 2 to 5 of the Cabri Author file ***gridsaxesgraphs***.

Select the **Grid** tool.

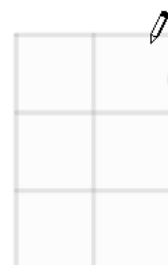


To get a square grid, click on the page to position one corner of the grid.



a new coordinate system

Click again to position the diagonally opposite corner.



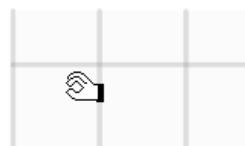
a new coordinate system

The result is a coordinate system region, with gridlines shown.



this coordinate system

You may later change the size of the region by dragging its edges or sides.



The location of a region may be changed by dragging its interior.

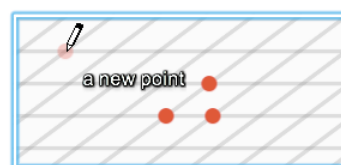
A more general grid may be created by first using the **Point** tool to create three points and then selecting these points with the **Grid** tool.



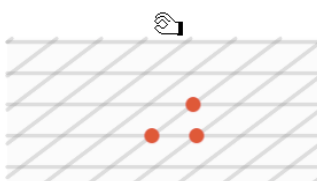
It is also possible to create a grid from axes: see section 2 below.

## 1.2 Points in the coordinate system region

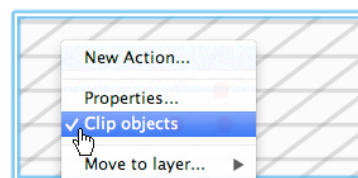
Use the **Point** tool to create a point on either of the grids on page 2 of the Cabri Author file associated with this document: notice how the point can snap to grid lines and intersections.



Note that the point can disappear off the edge of the region.



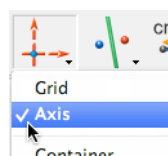
To show the point, right-click on the region and uncheck **Clip Objects**.



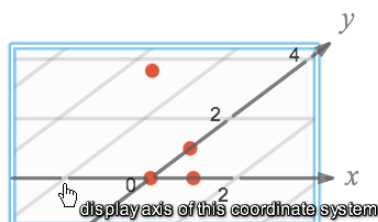
## 2. AXES

See pages 2 to 5 of the Cabri Author file **gridsaxesgraphs**.

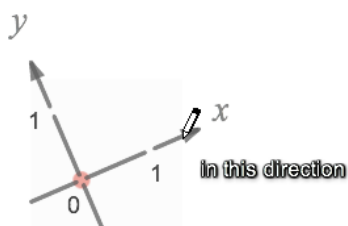
To create axes, first select the **Axis** tool.



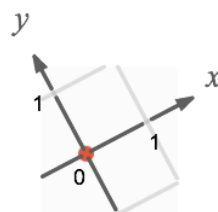
Axes may then be defined either by selecting a grid...



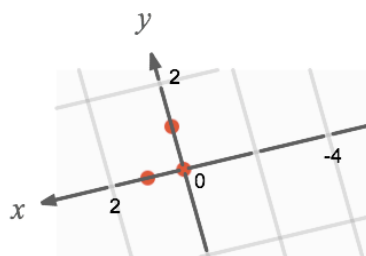
...or by clicking to select a location for the origin and an orientation for the x axis. This also defines a coordinate system region (although the grid is not showing).



You may define a grid from axes by using the **Grid** tool and then selecting the coordinate system region.



If the grid is defined by three points, manipulating these points will change the scale, orientation and position of the axes



Otherwise, drag the origin, the tip of each axis and the ticks on the axes to change scale, orientation and position (note that dragging the y axis has a different effect than dragging the x axis).

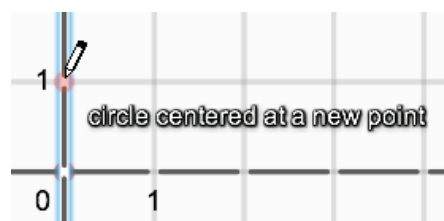
### 3. OBJECTS IN A COORDINATE SYSTEM REGION

Cabri is unique in that objects may easily be created that depend on axes rather than on the underlying plane.

See page 6 of the Cabri Author file ***gridsaxesgraphs***.

Select a construction tool, such as the **Circle** tool.

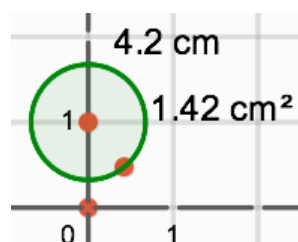
Click to select a first construction point within the coordinate system region (possibly on an axis).



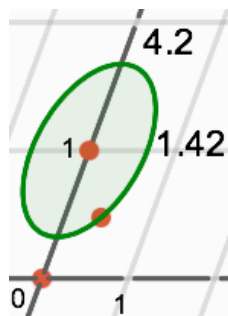
Click again to select a second construction point within the region.



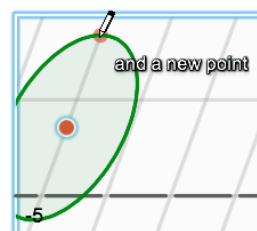
Make some measurements of the resulting figure (in this case circumference and area).



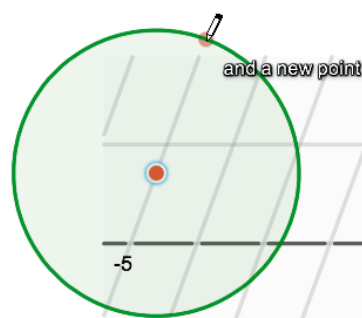
Now change the axes: the visual shape of the figure will change, but the measurements will remain constant.



Note: all initial construction points must be in the coordinate system region:



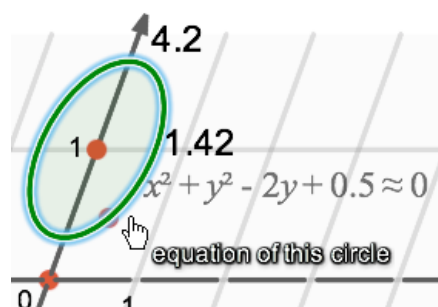
Otherwise the figure will be treated as based on the underlying plane.



Note: right-click on the region and uncheck Clip Objects to show the parts of objects which do not appear in the region.

#### 4. COORDINATES AND GRAPHS

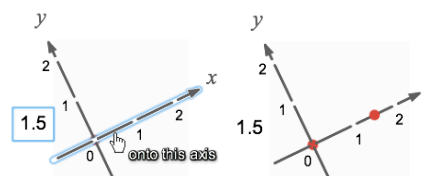
Use the **Coordinates and equation** tool in the Measurement toolbox to measure the coordinates of points or the equation of lines or circles.



Note that this tool will only work if all points used to construct the object are defined to be in the coordinate system region.

See pages 7 and 8 of the Cabri Author file **gridsaxesgraphs**.

It is possible to transfer values to either axis using the **Measurement transfer** tool.

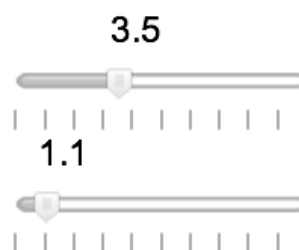


To plot a graph, first use the **Expression** tool to create an expression representing the function to be plotted, using the letter x for the variable, and other letters for any parameters to be chosen.

$$\cos(a \times x + b)$$

See page 6 of the Cabri Author file **gridsaxesgraphs**.

Sliders may be used to create the numbers for parameters.



Now select either the **Graph** tool or the **Apply Expression** tool, the expression, the numbers for parameters, and the coordinate system (if there is more than one coordinate system defined on the page) to get the graph.

