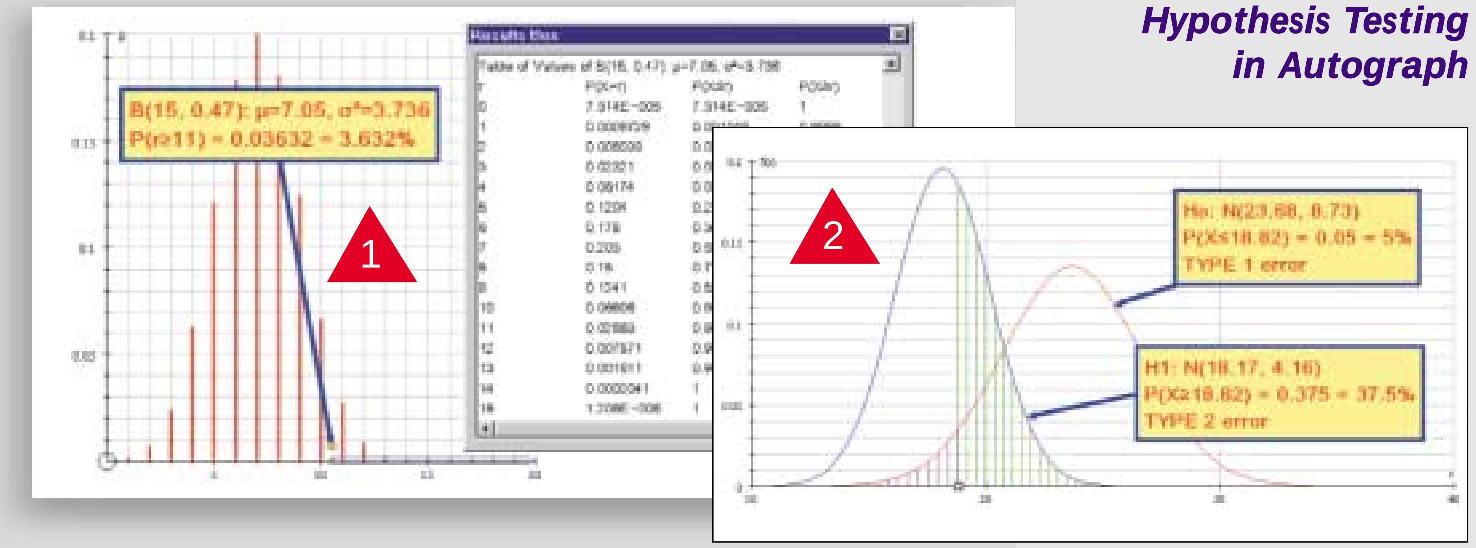
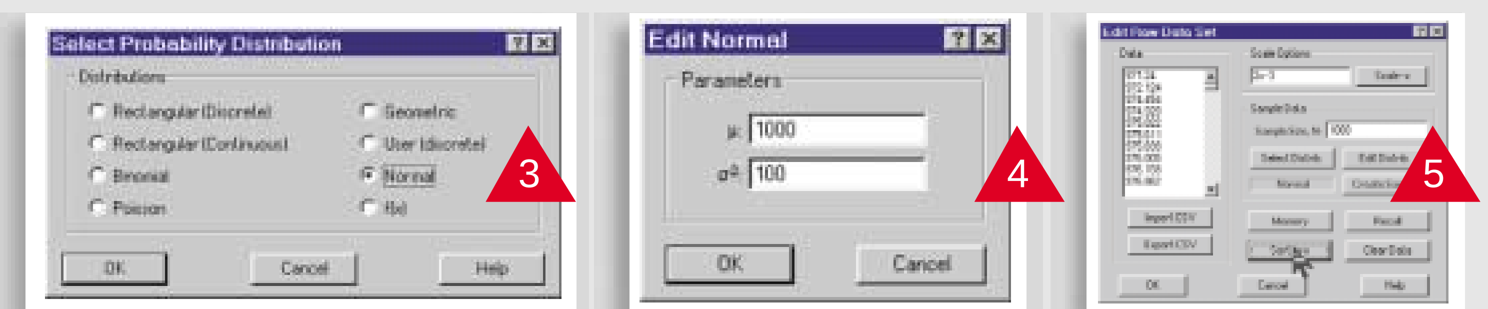
Hypothesis Testing in Autograph



1. A **Binomial distribution** with any parameters can be tested. The boundary values can be dragged, and the results box table can be copied out to Excel or Word.

2. Here, Type 1 and 2 errors from 2 **normal distributions** can be explored visually. The on-screen text boxes get data from the status bar, and the Autograph font provides the symbols.

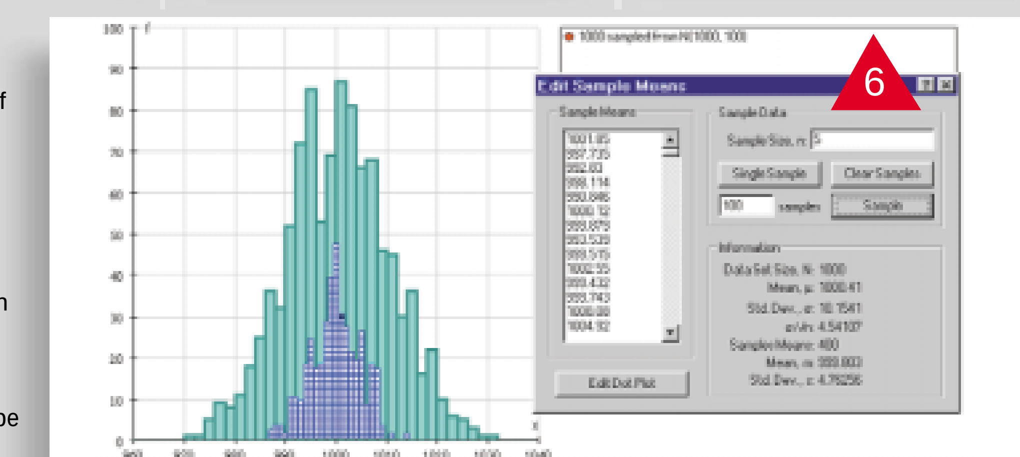


Generating data

3. Data can be generated from any of the **built-in** discrete and continuous distributions.

4.-5. Just set the parameters, and the number of samples.
A good **teaching point** is to discuss the resulting data before sorting – can the students anticipate the min and max values?

6. The resulting histogram can then be sampled to test the **Central Limit Theorem.**



Single User £50 + vat, 50-User £250 + vat, Site £400 + vat.

For further details of *Autograph*, and order details, contact:

CHARTWELL-YORKE Ltd, 114 High Street, Belmont Village, Bolton, Lancashire, BL7 8AL , England
Tel: +44 (0)1204 811001 Fax: +44 (0)1204 811008
orders@chartwellyorke.com www.chartwellyorke.com

THE DYNAMIC CLASSROOM

Lesson ideas with Autograph v 2.10*

* free upgrade now available, from: **www.chartwellyorke.com**

No. 2 January 2003

Using Autograph for ages 16-19

e.g. UK: AS-A2 Mathematics/Further Mathematics, International: IB

WHY AUTOGRAPH?

Dynamic software can add spectacular moving interactive images in the classroom, especially when a data-projector is installed. Autograph offers a dynamic approach to both coordinate geometry and probability/statistics, and is the perfect complement to Dynamic Geometry (real space) software.

There have been highly favourable reviews of Autograph in many countries and a selection is included on the Autograph web site. A recent TEEM assessment by UK classroom teachers concluded:

"This package is an extremely practical and useful mathematical tool and is an essential part of any Mathematics teacher's kit."

Also in this issue:

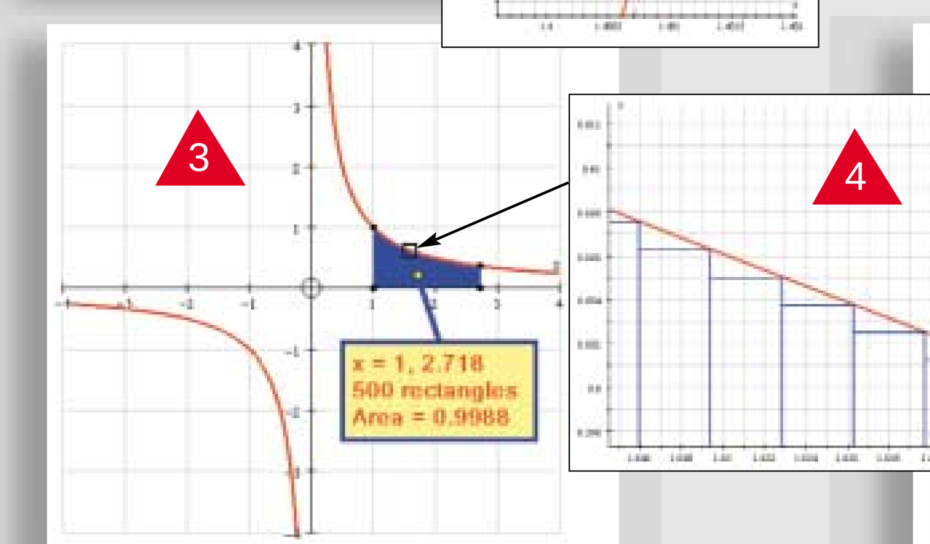
All these lesson ideas, and many others, have been recorded and can be viewed on chartwellyorke.com

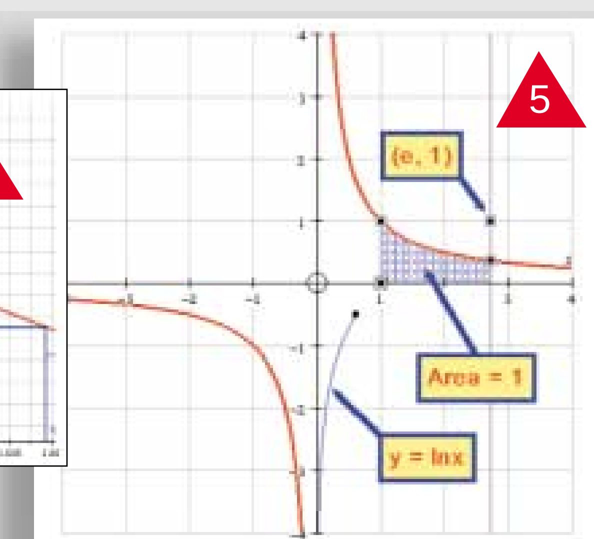
Introducing 'e'

1.-2. Enter and plot $y = a^x$ (with SLOW plot on).
Set a = 2. Place a point ON the curve, draw a tangent and move the point up and down to discuss the slope. Draw the gradient function. Use zooms and the constant controller to vary 'a' to find a value that gives a gradient function the same as $y = a^x$.

2.-4. Draw **y = 1/x** (slowly!). Place and select points on the curve at x = 1 and x = 2. Find the area using 500 rectangles. Drag the right point until x = 2.718, when the area is close to 1 (an underestimate – see the zoom!)

5. Mark the points (1, 0) and (e, 1) as 'targets', so that the (slow) plot of **y = lnx** can be correctly anticipated, and can be subsequently shown to be the function whose gradient is y = 1/x (for x > 0).

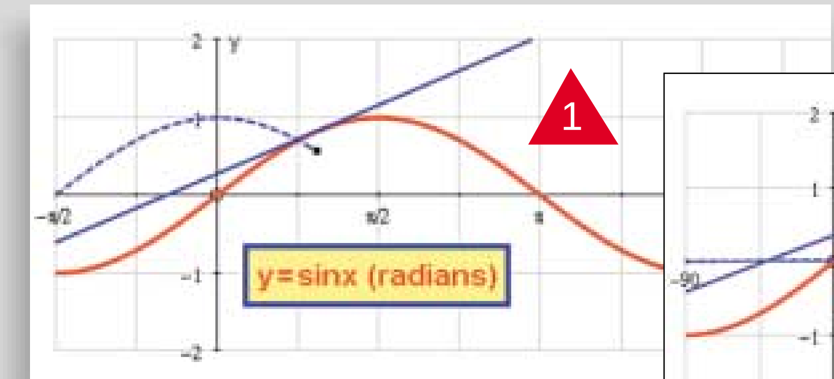


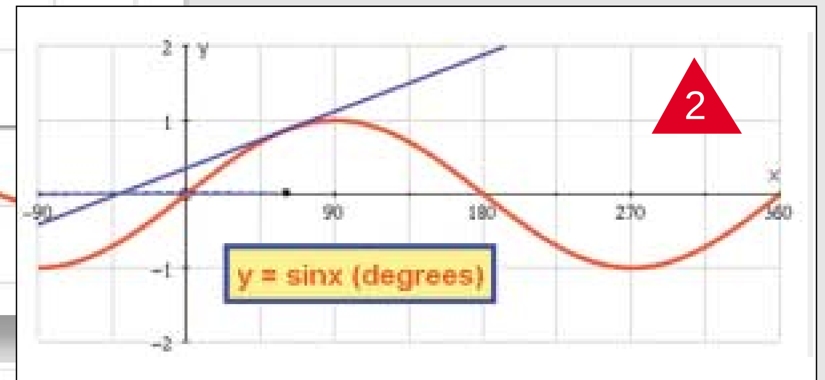


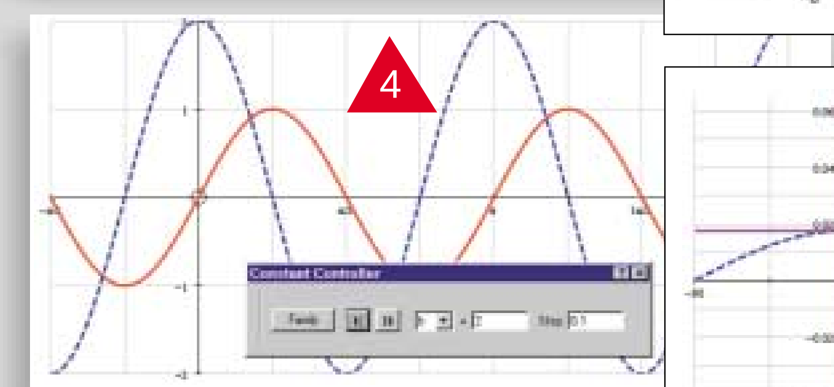
www.chartwellyorke.com

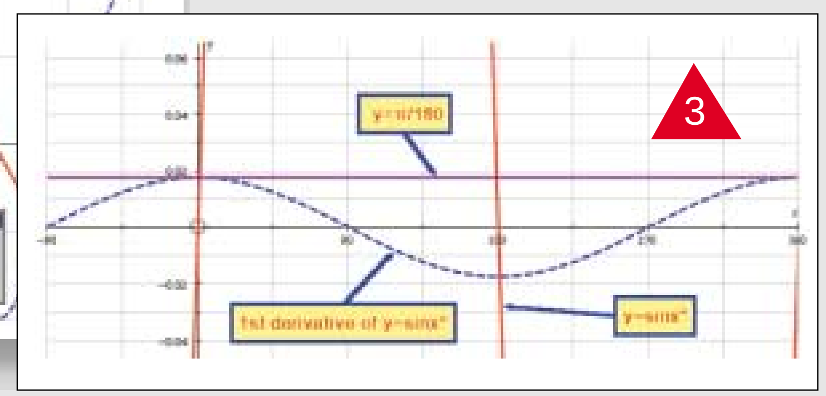
The Dynamic Classroom, using Autograph (16-19)

Visualising Trigonometry





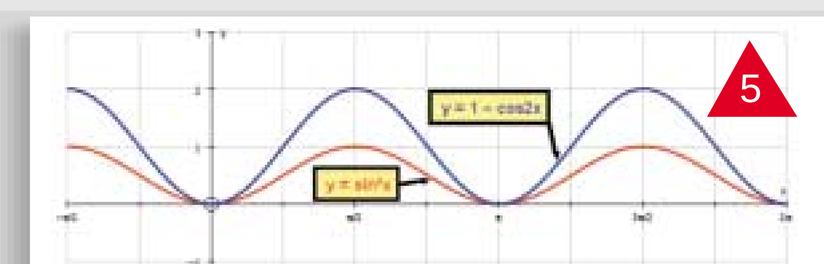


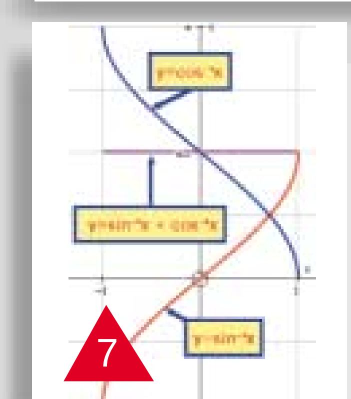


1. Plot **y = sinx in Radians** (slowly). Use the 'default' scales (x: $-\pi/2$ to 2π). Then plot the Gradient function (slowly) – a roaming tangent is drawn and the 1st derivative is created. It pauses automatically at all max, min and points of inflexion.

2.-3. Doing the same in **Degrees** is instructive ('default' scales this time offer x: –90° to 360°) a good application of the Chain Rule, since y = sinx° = $\sin(\pi/180.x)$, so dy/dx = $\pi/180$. $\sin(\pi/180.x)$.

4. Plot **y = asin(bx + c) + d**, with c = 0 and d = 0. The gradient function is a 'dependent' object, so if any of a, b, c or d is varied the gradient will vary accordingly, offering an excellent summary test of understanding of the **Chain Rule**.

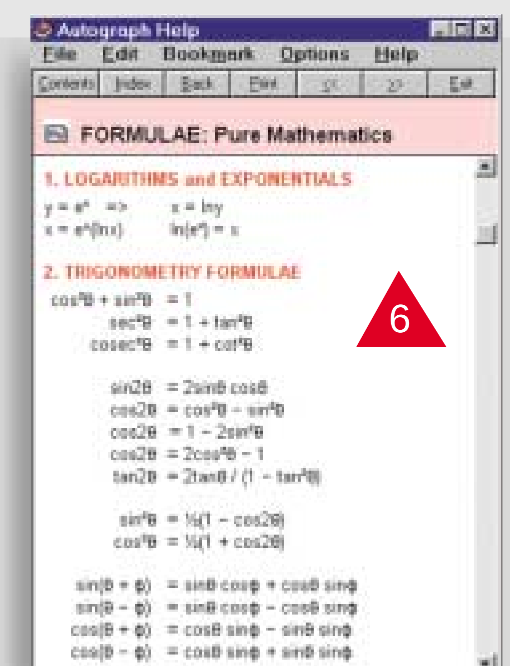




5. There are many opportunities to show **the Trig Formulae** graphically. Here $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$ is shown on the axes, and also in the Help file.

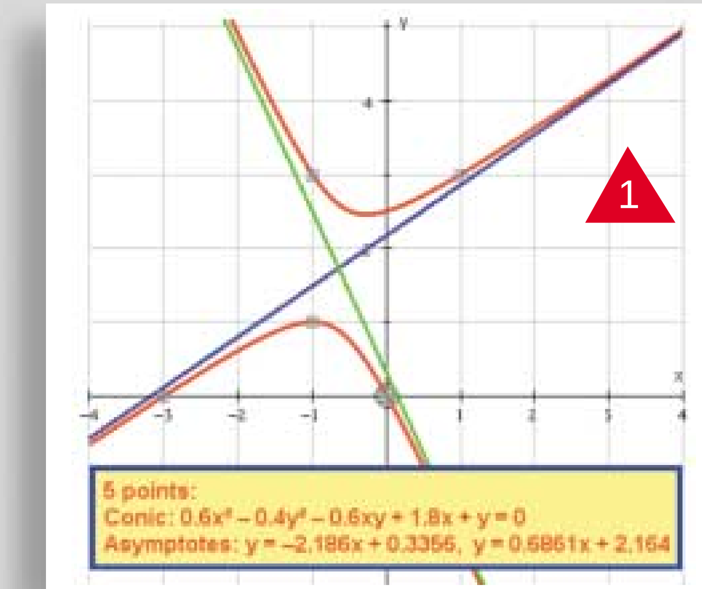
6. There are over 200 pages in the **Autograph HELP file**, including a long list of formulae for pure mathematics and statistics.

7. A nice illustration of the property that the 2 angles in a right angled triangle add to $\pi/2$.



The Dynamic Classroom, using Autograph (16-19)

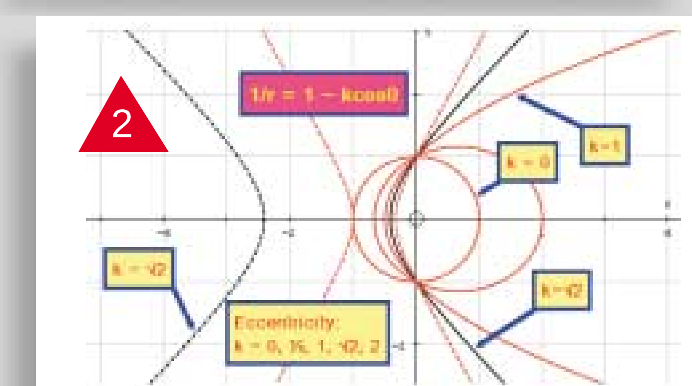
Fun with Conics

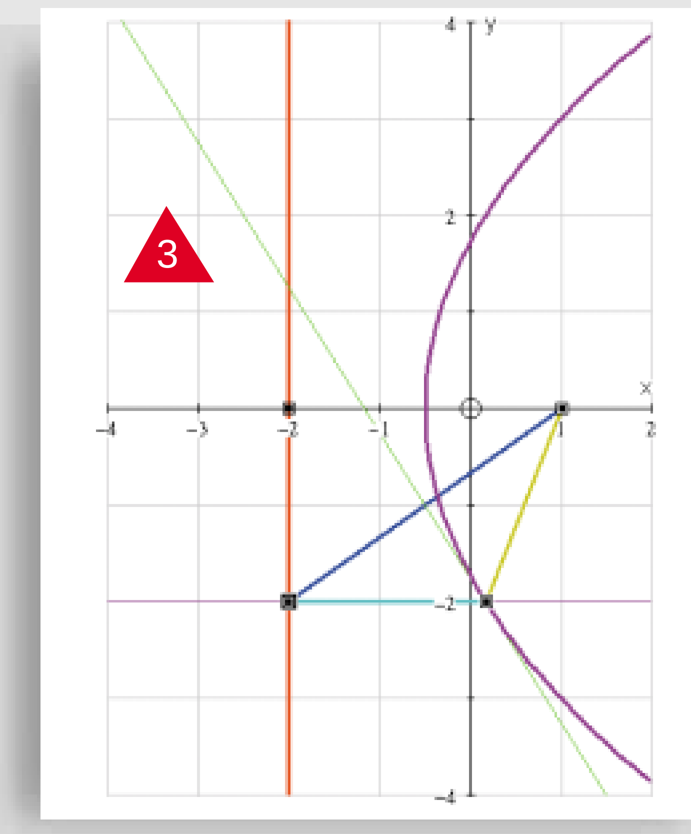


1. 5 selected points, construct a **conic** – a dynamic object that will recalculate if any of the points is moved.
Select each branch in turn and construct the asymptote.

2. A family of conics in polar form: **1/r= 1 – kcos**θ .
Polar graphs can also be entered in the form r = f(θ), r^2 = f(θ)

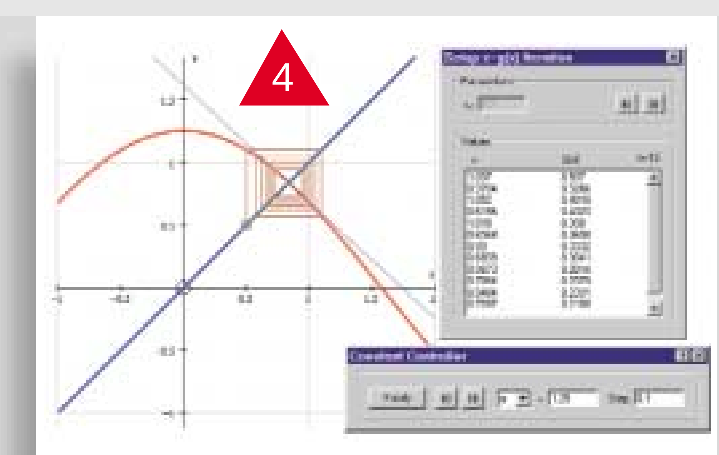
3. A construction of a **parabola** from first principles, with directrix x = –2, and focus (1, 0).





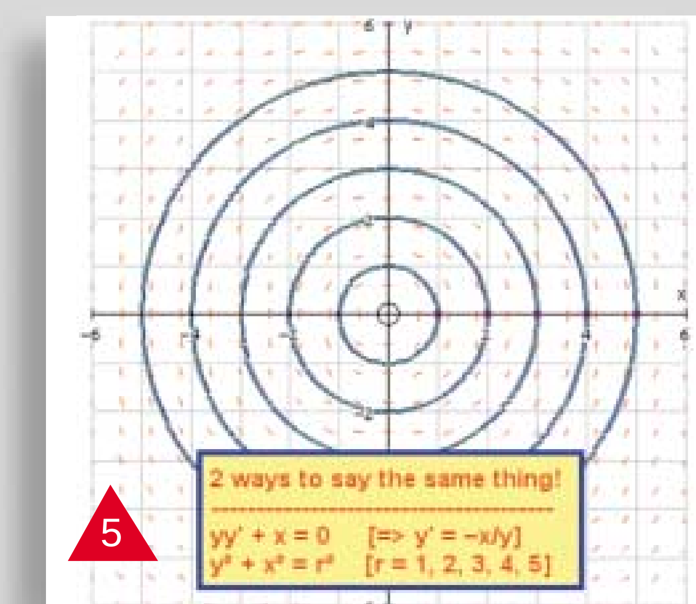
4. Fixed point iteration

Plot **y = x** and **y = acosx**. Put a point ON y = x, select it and y = acosx, and use the right-click option "x = g(x) iteration". This generates a dependent object that will update if anything is changed (eg the position of the point, or the value of 'a').



5. Differential Equations

Both 1st and 2nd order differential equations can be entered **implicitly** in *Autograph*, as dynamic objects.



www.chartwellyorke.com