AcroTeX.Net

AcroFLeX Graphing System

D. P. Story

The links to AcroTeX software:

eDucation Bundle
Presentation Bundle
@EASE
Game Packages

Play again

What is AcroFleX?

The word **AcroFleX** is meant to convey a merging of two computer technologies:

- **Acro**: connotes both **Adobe Acrobat** (**Adobe Reader**) and **AcroTeX** (as in the **AcroTeX eDucation Bundle** or, just **AeB**).
- **FleX**: connotes **Adobe FLEX 3**. FLEX 3 is used to create SWF files to interact with the user. In the case of graphing, plotting information is passed from Acrobat, via JavaScript, to the Flash widget. ActionScript takes the data, plots the points provided, and connects them with a smooth curve.
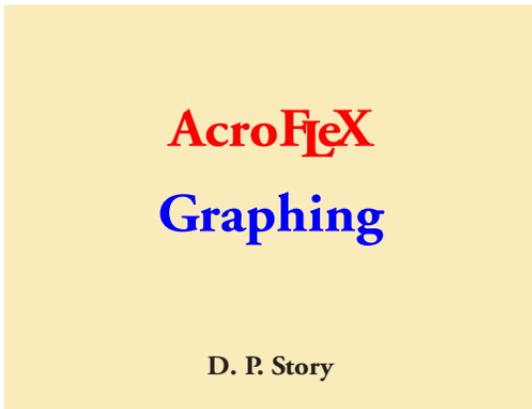
AcroFleX by AcroTeX: This graphing system and this demonstration file were developed by D. P. Story using the AcroTeX eDucation Bundle, Adobe® Acrobat® 9 Pro, and Adobe® FLEX™ 3.

Acrobat 9 Pro introduces the rich media annotation that plays FLV movies and SWF files natively. Acrobat also provides a scripting bridge between JavaScript for Acrobat, and ActionScript, the scripting language of Flash player. This bridge enables the PDF and the Flash widget, embedded in the rich media annotation, to communicate. The scripting bridge opens up wonderful opportunities for application to the education sector. The graphing of AcroFleX is one such application of the new PDF-Flash connection to education.

AcroFleX uses the commercial product Adobe FLEX Builder 3 and FLEX 3 SDK to produce Flash widgets, and the AeB to create PDF documents with appropriate JavaScript to communicate with the Flash widget. FLEX Builder 3 is currently free for students and educators, the FLEX 3 SDK is free to all.

AcroF_LeX by AcroTeX

The first goal in AcroF_LeX development was to build an interactive graphing screen educators could use in their PDFs.

AcroF_LeX
Graphing

D. P. Story

←↑ ↓→

$x =$ … $n =$

$y =$ …

$t =$ …

Populate Mode

Parametric Equations: $x = \cos(t); y = \sin(t)$

Polar Function: $r = 1 + \sin(\theta)$

Instructions: This graphing system can graph a function of x, a pair of parametric functions of t, or a polar function of t.

1. For a function of x, enter an algebraic expression to be graphed, e.g., `3x^2-1`, `4sin(2x)`, `ln(x)`, `e^(x+1)`. For parametric equations, two functions of t separated by a semicolon (;) e.g., `cos(t);sin(t)`. For a polar function, enter a single expression that is a function of t, e.g., `1+sin(t)`.

2. Set the graph viewing window: The range of the horizontal axis (x-axis) and range of the vertical axis (y-axis). For parametric plotting, set the range of the t variable.

3. Enter the number of points, n, to plot.

4. Click the Graph It! button.

5. Shift the viewing window horizontally or vertical; or zoom in or out.

6. Click `Clear` to clear the plot; use shift-click to deactivate the graphing screen.

Graphing Predefined Functions

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The document author, that's you, can prepare some functions for the student to view: $\sin(x)$, $\sin(2x)$, $\sin(3x)$, and $\sin(4x)$. All functions are graphed over the interval $[0, 2\pi]$. Let's view a graph with a vertical asymptote, shall we? Try $y = 1/(x-1)$ and $y = 1/(x-1)^2$.

Quiz What type of symmetry does the function, graphed above, have?

(a) x-axis symmetry   (b) y-axis symmetry   (c) origin symmetry

Multiple Curves and Plots

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Plot multiple curves using predefined functions:

- $\sin(x)$, $\sin(2x)$, $\sin(3x)$, $\sin(4x)$.

Let's plot some points:

- Points on $\sin(x)$ (clear the graphing screen, click on this $\sin(x)$ link, then click on the plotted points link)

- Plot $(1, 1); (2, -1); (4, 1/3); (3, -1/2)$

- Plot $(2, 0); (1, -1); (3, .5); (4, 1); (6, 0)$

Graphing in a Floating Window

On this page, we take a different approach, by graphing functions in a *floating window*. This might be appropriate for graphing preset functions. Now let's copy and paste some of the previous text here: The document author, that's you, can prepare some functions for the student to view: $\sin(x)$, $\sin(2x)$, $\sin(3x)$, and $\sin(4x)$. All functions are graphed over the interval $[0, 2\pi]$. Let's view a graph with a vertical asymptote, shall we? Try $y = 1/(x-1)$ and $y = 1/(x-1)^2$.

Controlling the Floating Window. Clicking a graphing link will open the floating window and graph the defined function. Clicking the AcroFleX icon closes the window. The window itself has controls. The clicking the upper-right corner closes the window. Use the lower-left corner to resize the graph window (click and drag the lower-left corner). Click and drag anywhere else on the boundary will move the window.


The following quiz integrates the quiz/shortquiz environment with the AcroFleX Graphing routines, and uses \defineGraphJS to graph the input of the user.

Question Find the equation of the line tangent to the graph of $f(x) = 2x^2$ at the point $(1, 2)$.

Below is another example of the use of \defineGraphJS. A link is created with two calls to the graphing routines, one to plot a sine curve, the other to plot points on that curve. Consider the sine function, and indicated points

Curves with filled area

AcroFLeX
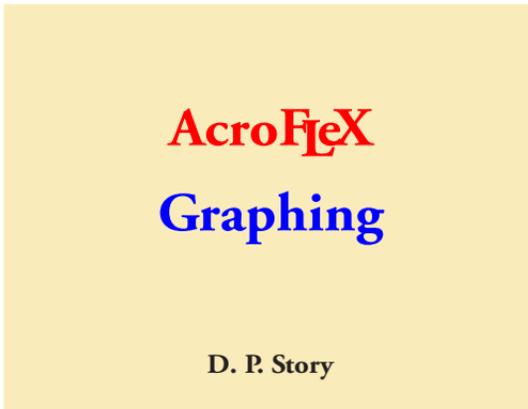
Graphing

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Plot multiple curves using predefined functions:

- $\sin(x)$, $\sin(2x)$, $\sin(3x)$, $\sin(4x)$.
- Parametric Equations
  - $x = \cos(t)$; $y = \sin(t)$
  - $x = t^2$; $y = t$

- Polar Functions
  - $r = 1 + \sin(\theta)$
  - $r = 1 + 1.25\sin(\theta)$

Question Find the area of the region *below* the graph of $f(x) = \cos(x)$ and *above* the graph of $g(x) = \sin(x)$, as shown in the graph screen above.