⊞— Library

⊟— pLine

Drawing lines

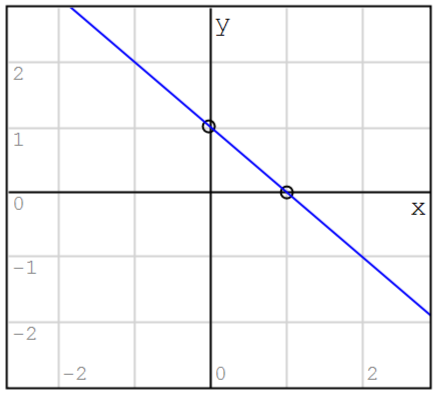
pLine (*A*)   If cols(A)≡3, draws the line ax+by+c≡0, where a,b,c are the cols of A
If cols(A)≡2, draws the line between the points defined by the A rows
If cols(A)≡1, assume that A have submatrices whith two or three cols.

Examles

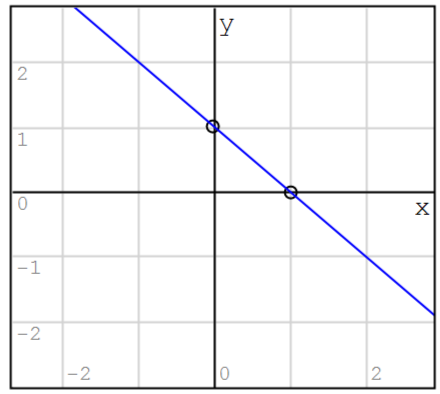
$$P := \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

$$M := \begin{bmatrix} 3 & 3 & -3 \end{bmatrix}$$

$$\Pi(MP) := \begin{cases} pLine(MP) \\ augment(P, \text{"o"}) \end{cases}$$



Π (M)



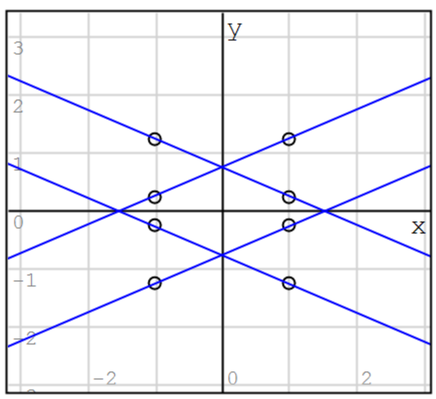
Π (P)

The same lines defined by its coefficients or two points

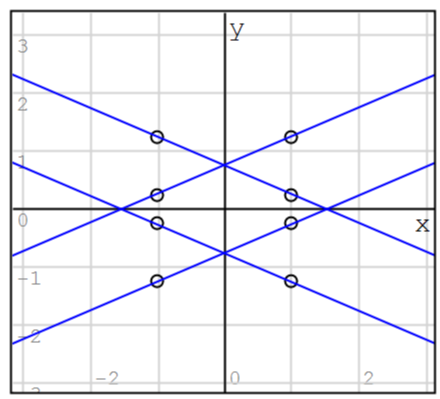
$$M := \begin{bmatrix} 2 & 4 & -3 \\ 2 & -4 & -3 \\ -2 & 4 & -3 \\ -2 & -4 & -3 \end{bmatrix}$$

$$P := \begin{bmatrix} \begin{bmatrix} 1 & 0.25 \\ -1 & 1.25 \end{bmatrix} \\ \begin{bmatrix} 1 & -0.25 \\ -1 & -1.25 \end{bmatrix} \\ \begin{bmatrix} 1 & 1.25 \\ -1 & 0.25 \end{bmatrix} \\ \begin{bmatrix} 1 & -1.25 \\ -1 & -0.25 \end{bmatrix} \end{bmatrix}$$

$$\Pi(MP) := \begin{cases} pLine(MP) \\ mat2sys_1\left(\overrightarrow{augment(P, \text{"o"})}\right) \end{cases}$$



Π (M)



Π (P)

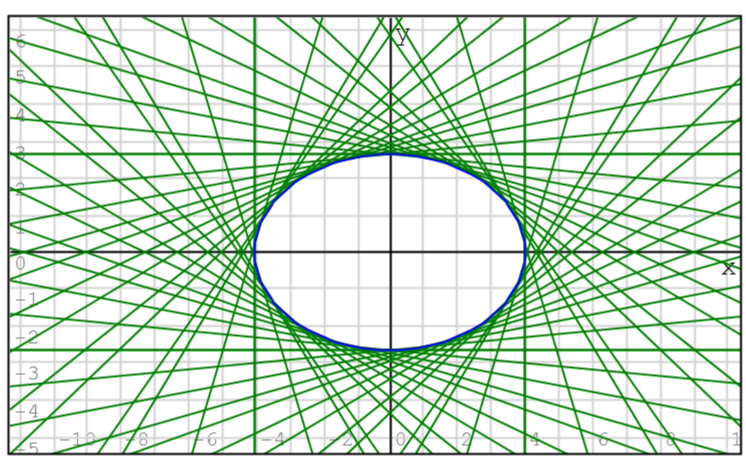
Tangents to an implicit plot

$$f(x, y) := \frac{x^2}{4} + \frac{y^2}{\sqrt{3}} - 4$$

$$\begin{bmatrix} B := \begin{bmatrix} -4 & 4 \\ -4 & 4 \end{bmatrix} & N := \begin{bmatrix} 30 \\ 30 \end{bmatrix} \end{bmatrix}$$

$$C := pContour(\text{"f"}, B, N)$$

$$\Pi := \begin{cases} pCycleC(C) \\ \text{""} \\ pLine(C) \end{cases}$$



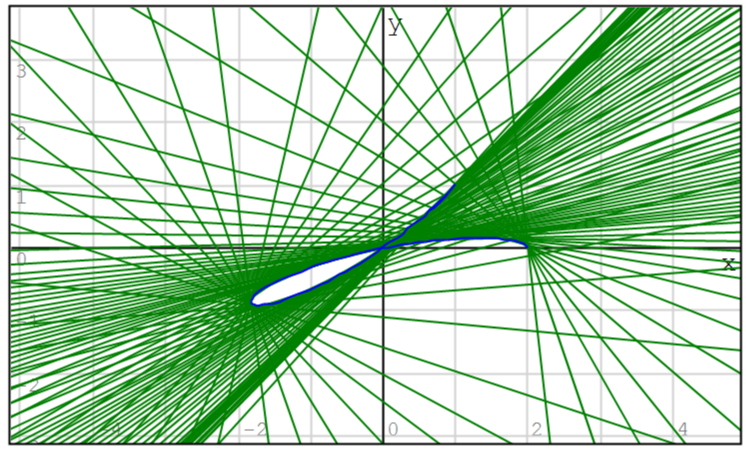
Π

Tangent to an adaptive plot

$\rho(\theta) := \mathrm{eval}\left(2 \cdot \cos(7 \cdot \theta) \cdot \mathbf{e}^{i \cdot \theta}\right)$

$C := ReIm(pAdapt(\rho, 0, 0.25 \cdot \pi))$

$\Pi := \begin{cases} C \\ \text{""} \\ pLine(C) \end{cases}$



Π

pEnvelope

Enevelopes

$pEnvelope(A)$ Returns the intersections of two consecutive lindes defined in A as the coefficients of a rect line given by its general formula ax+by+c≡0

Examles

This procedure draws the envelope of the uniparametric family of lines given by λ

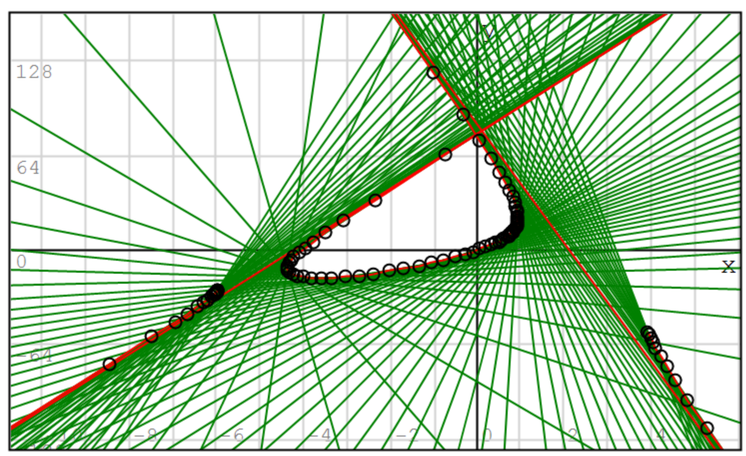
$\lambda(t) := \left[t-1 \;\; 0.1 \cdot \cos(t) \;\; t^2 \right]$

$T := pR(-4, 4, 100)$

$\Lambda := pRGrid(\text{"λ"}, T)$

$E := pEnvelope(\Lambda)$

$\Pi := \begin{cases} augment(E, \text{"o"}) \\ E \\ pLine(\Lambda) \end{cases}$



Π

This example compare the numerical procedure with the symbolic one.

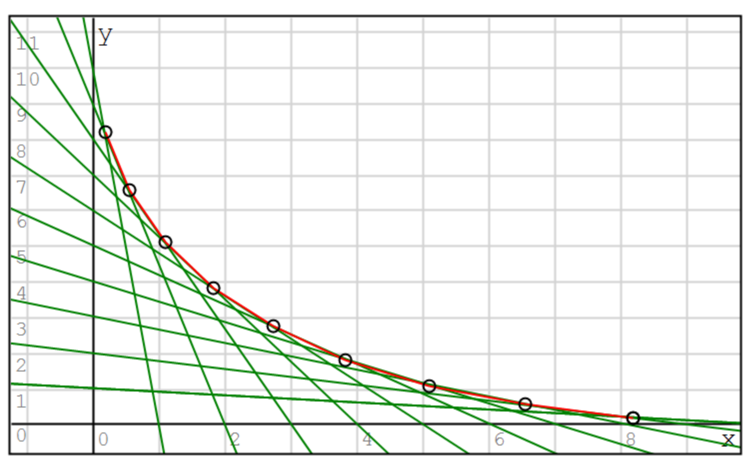
$\lambda(t) := \left[\frac{1}{t} \;\; \frac{1}{11-t} \;\; -1 \right]$

$T := pR(1, 11, 10)$

$\Lambda := pRGrid(\text{"λ"}, T)$

$E := pEnvelope(\Lambda)$

$\Pi := \begin{cases} augment(E, \text{"o"}) \\ E \\ pLine(\Lambda) \end{cases}$



The symbolic solution isn't inmediate:

$$E(x, y) := (x - y)^2 - 22 \cdot (x + y) + 121$$

$$C(x, y, t) := \begin{bmatrix} x & y & 1 \end{bmatrix}^T \cdot \lambda(t)^T$$

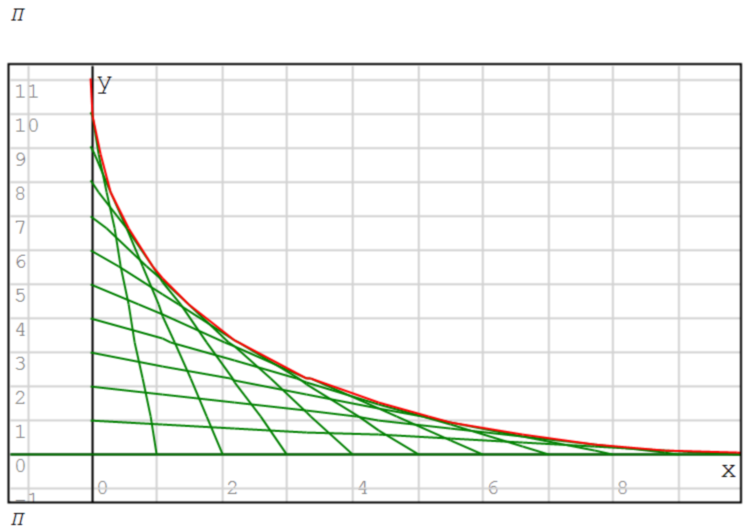
$$\left[B := \begin{bmatrix} 0 & 11 \\ 0 & 11 \end{bmatrix} \quad N := \begin{bmatrix} 20 \\ 20 \end{bmatrix} \right]$$

for $k \in [1 .. \text{length}(T)]$

$\quad C(x, y) := C(x, y, T_k)$

$\quad Co_k := pCycleC(pContour(\text{"C"}, B, N))$

$$\Pi := \begin{cases} \text{""} \\ pCycleC(pContour(\text{"E"}, B, N)) \\ pCycleC(Co) \end{cases}$$



Alvaro