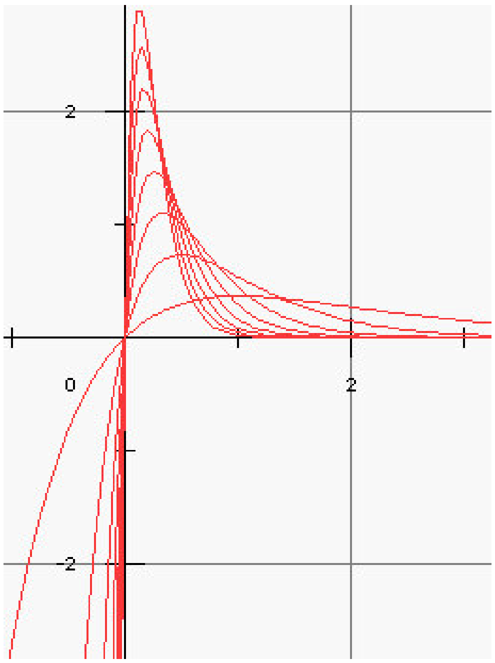
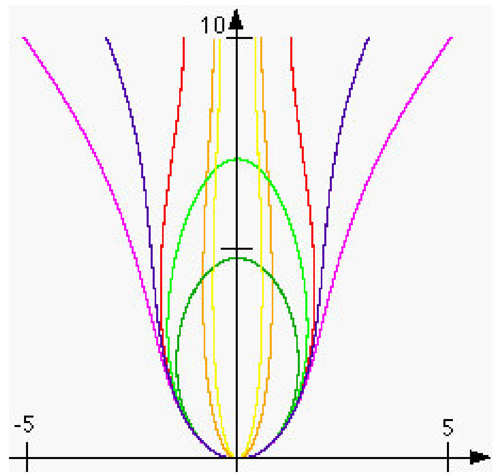
CURVOPHILIE



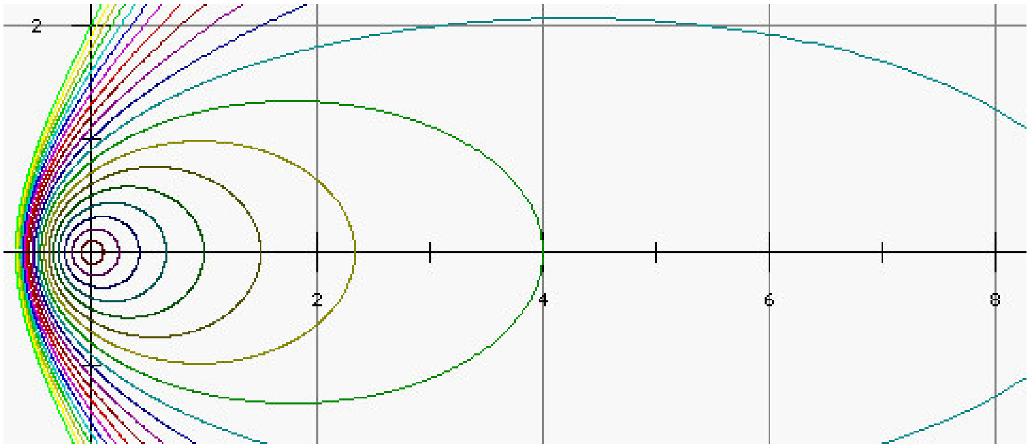


$125x^2 = 2y^3 - 42y^2 + 240y$ (en rouge)

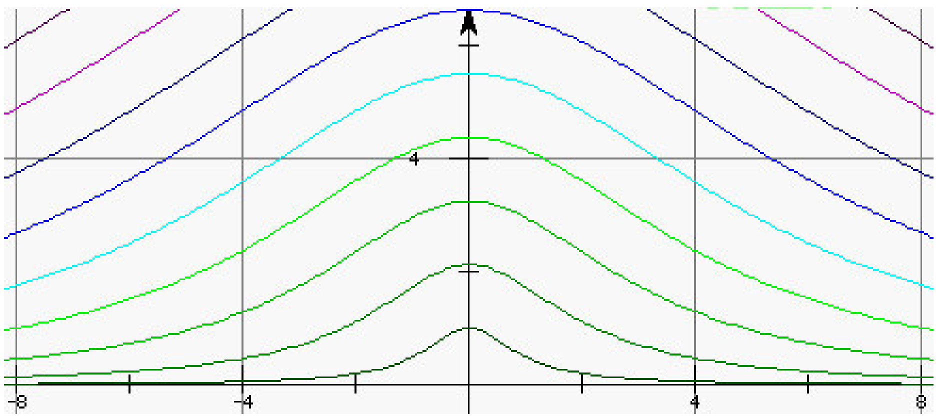
A gauche, famille
$y = m^2 x \exp(-mx)$ pour m de 1 à 8

Sources

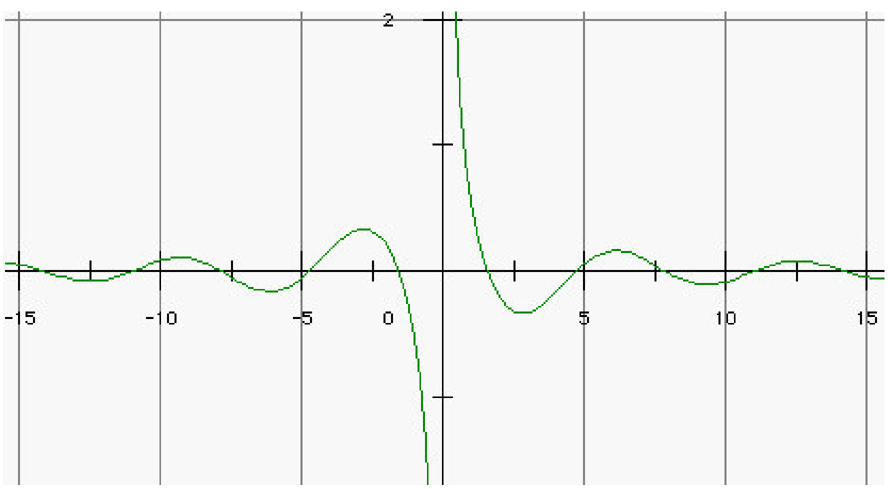
Cours de Mr Biancamaria en math sup à Henri IV
Logiciels Curvus pro et GraphEq
Sites http://www.cut-the-knot.com, www-history.mcs.st-and.ac.uk et www.willamette.edu/~sekino
J.Brette Courbes mathématiques Revue du Palais de la Découverte Juillet 1976
De points en Courbes CRDP Dijon 1987



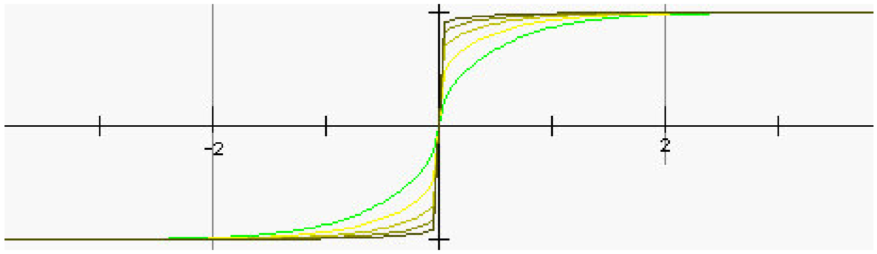
Coniques r = e / (1 - ecost) pour des excentricité e de 0,1 à 2 en 0,1



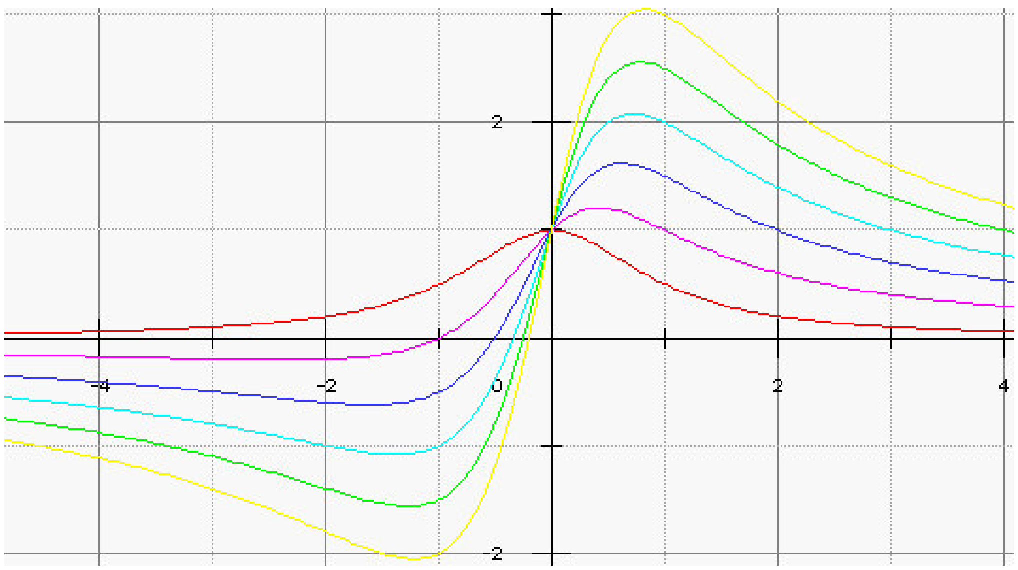
Cubique d'Agnesi $y = a^3 / (a^2 + x^2)$ *pour a de 1 à 9*



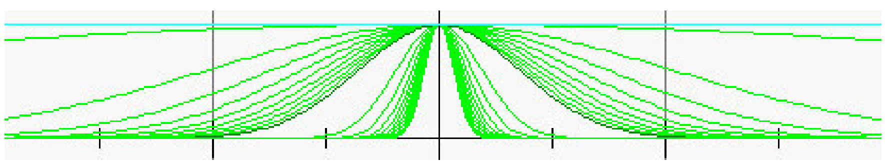
$y = cos(x) / x$



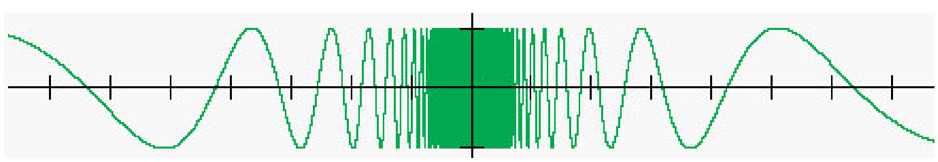
y = (th x)^(1/2^m) pour m = 1 à 5



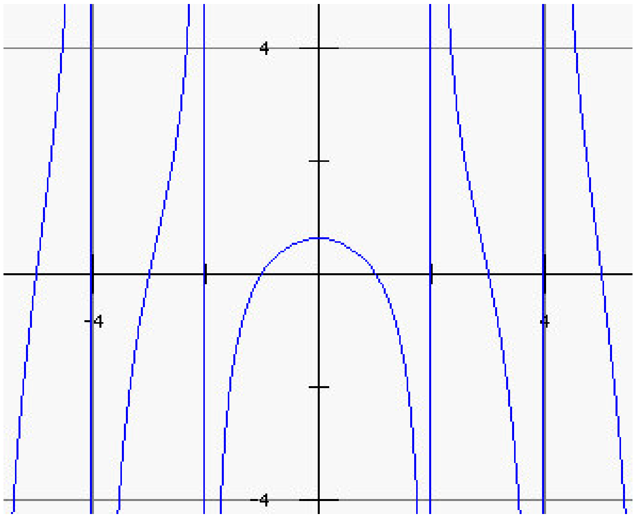
Cubiques "anguinéa" y = (mx+1)/(x2+1) pour m de 0 à 5



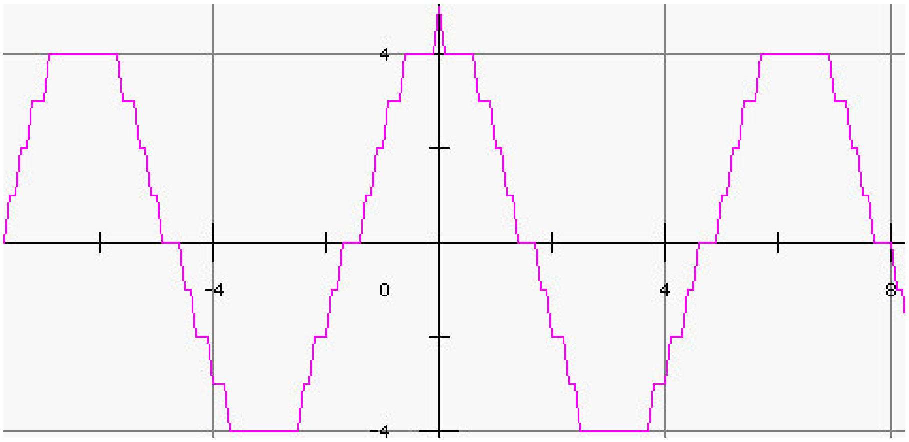
y = exp(-mx2) pour m de 1 à 30



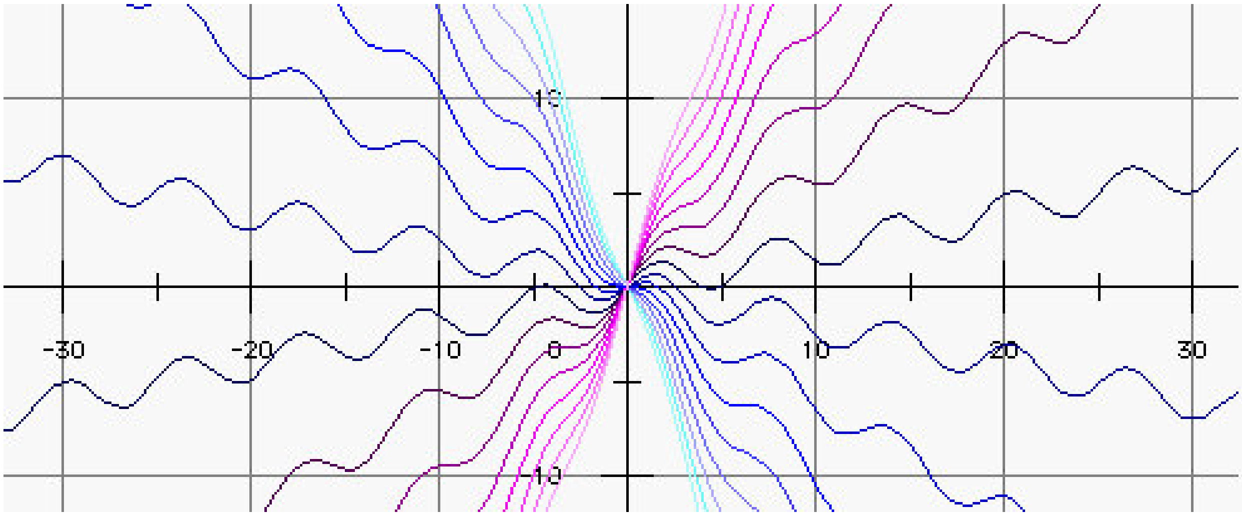
y = sin (1/ x)



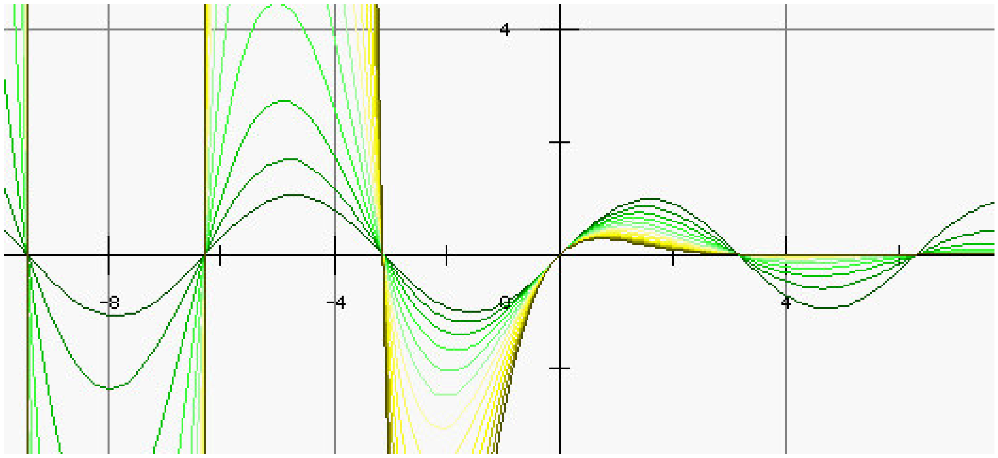
La quadratrice de Dinostrate y = x / tan(πx/2)



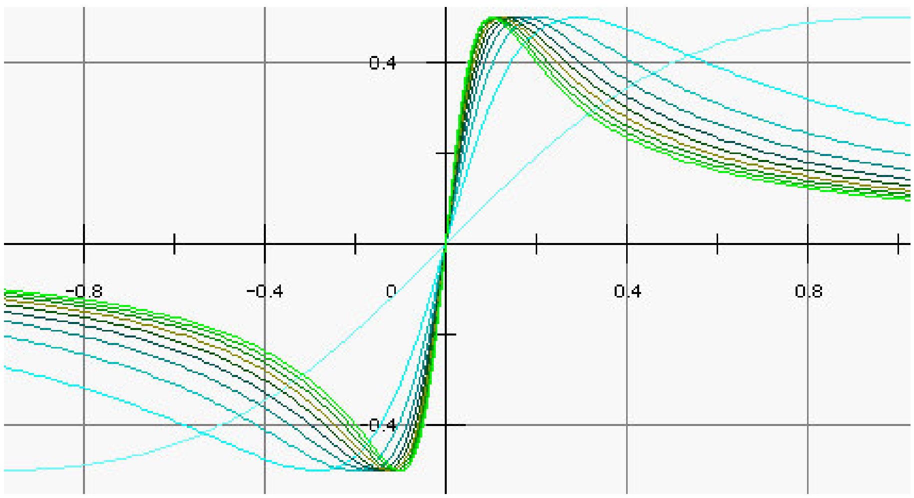
y = int (5cos x)



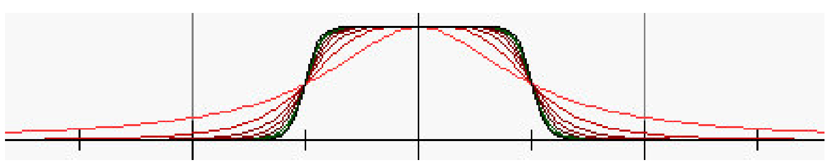
y = mx + sin x pour m de -3 à 3



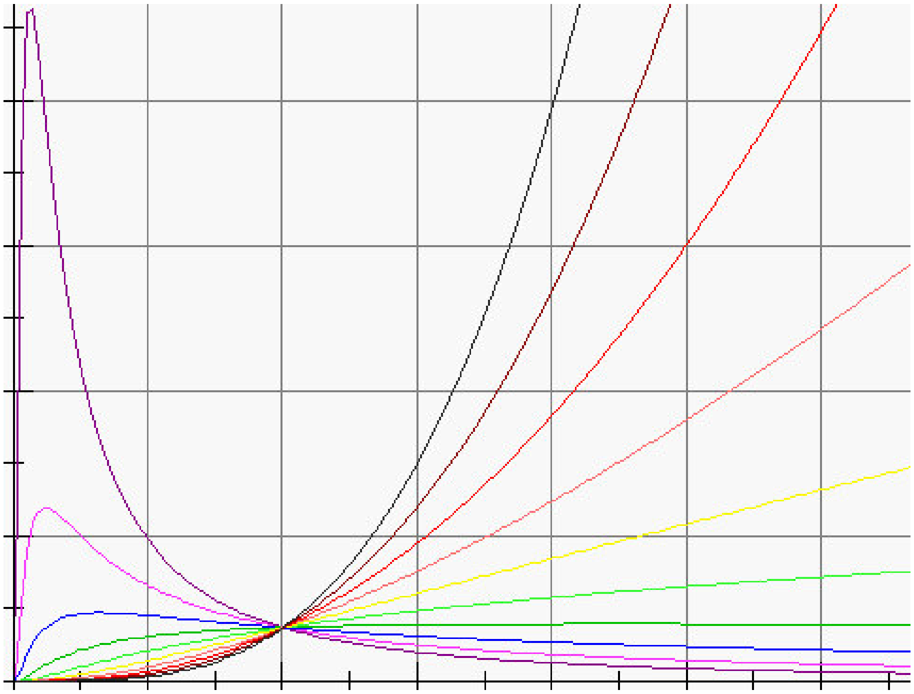
$y = exp(-mx)sin\ x$ pour $m = 0{,}01$ à 12



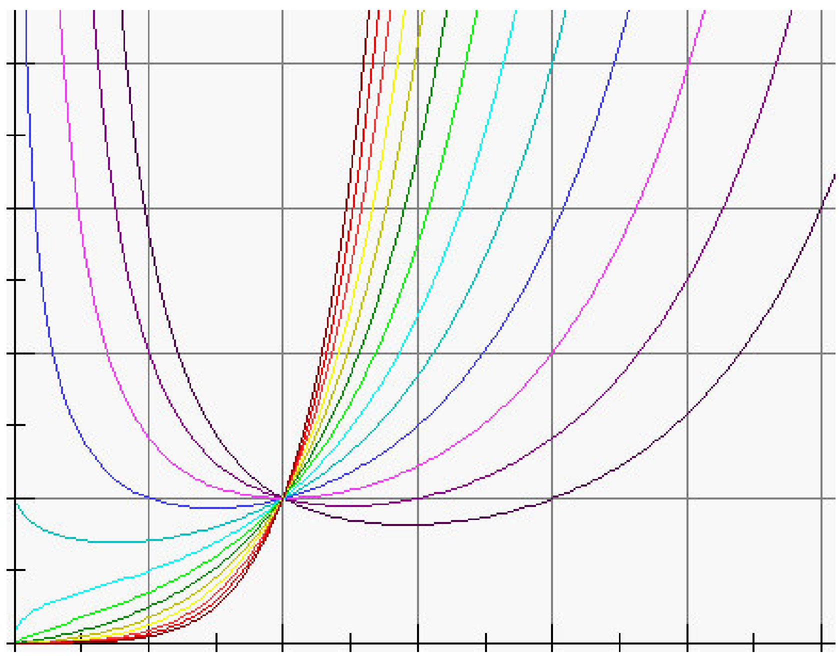
$y = (x = \sqrt{m}) / (1+mx^2)$ pour m de 1 à 100 exemple de convergence non uniforme vers 0



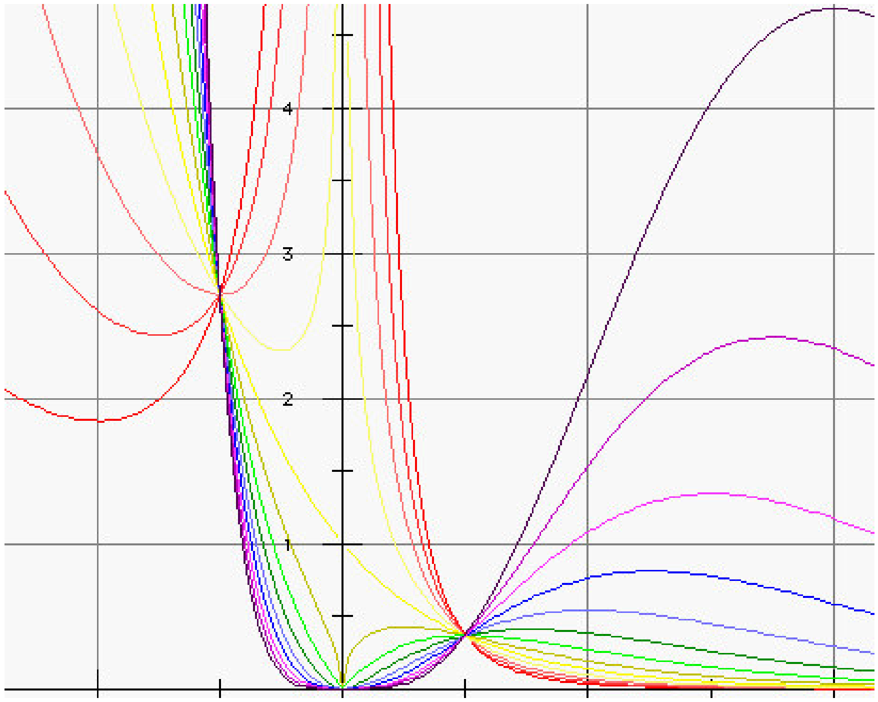
$y = 1/(1 + x^{2m})$ pour m de 1 à 8 (convergence non uniforme)



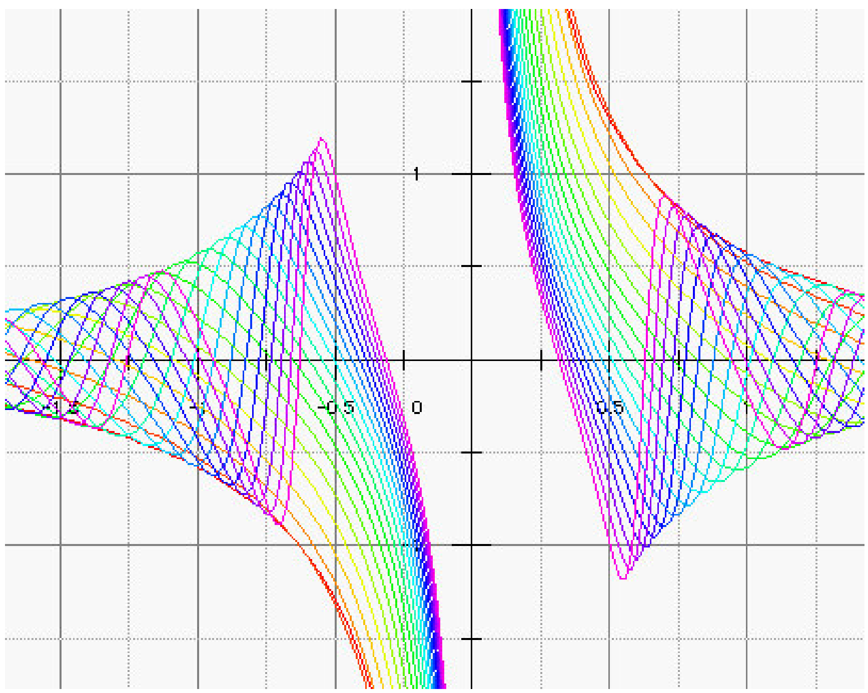
y = $x^m exp(-1/x^{1/2})$ *pour m de -2 à 3*



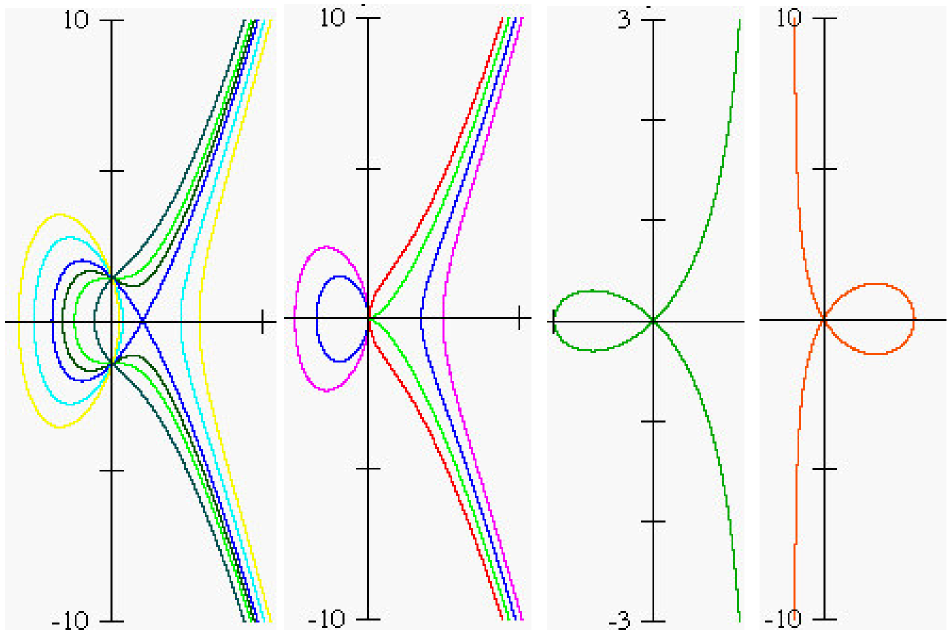
y = x^{x+m} *pour m de -2 à 4 en 0,5*



y = exp(-x+mln |x|) pour m de -2 à 4 en 0,5



y = sin mx / (x² - cos mx + 1) pour m = 1 à 10



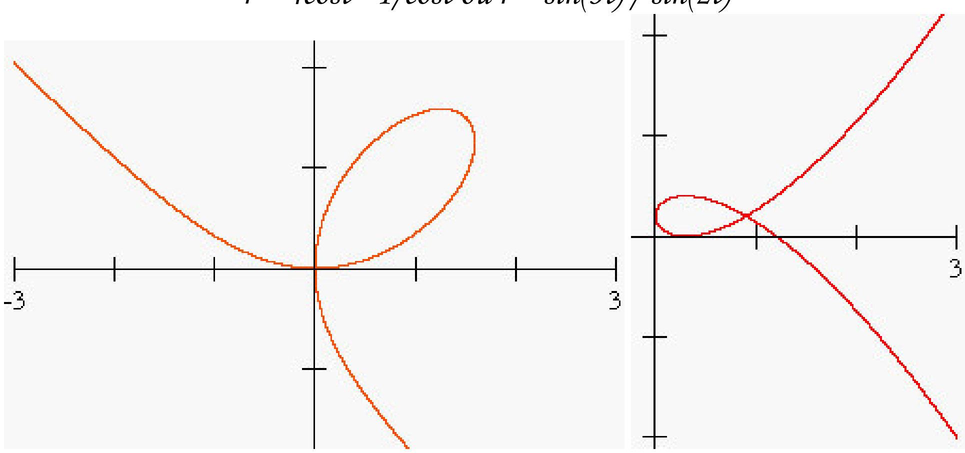
Cissoïdes droites (inverses de coniques par rapport à un sommet) $y^2 = x^3 - 3mx + 2$ pour m = -1 (verte) à 2 (jaune)

$y^2 = x^3 - 3mx$ pour m = -1 (rouge), 0 (verte) à 2 (violette)

en vert et solitaire la strophoïde droite annalagmatique $y^2(1-x) = x^2(1+x)$ d'équation polaire $r = \cos 2t / \cos t$,

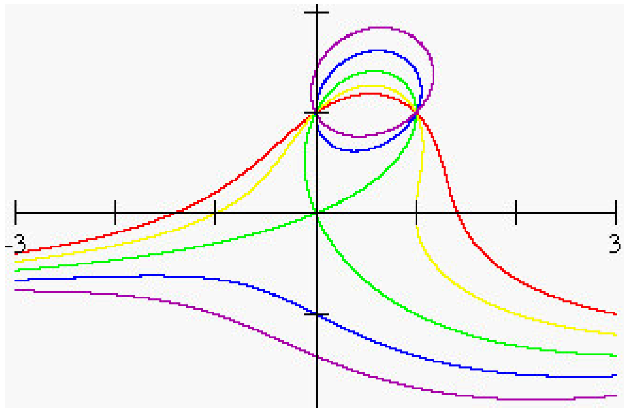
à ne pas confondre avec la trissectrice de MacLaurin (orange) $x(x^2+y^2) = 3x^2 - y^2$ d'équation polaire

$r = 4\cos t - 1/\cos t$ ou $r = \sin(3t) / \sin(2t)$

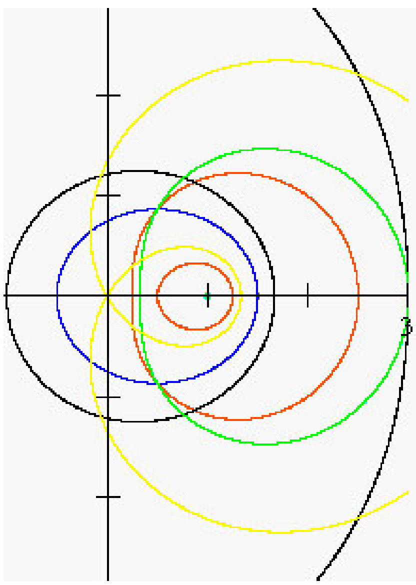


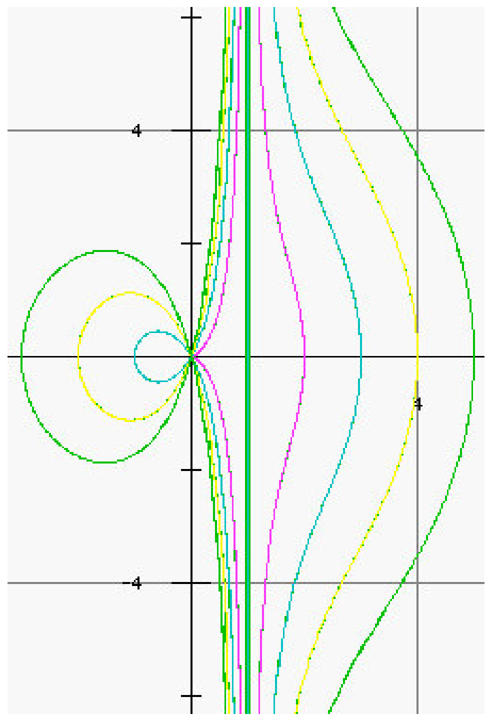
Folium de Descartes $x^3+y^3 = 3axy$ ici pour a = 1, (définie en terme d'ensemble de conjugués harmoniques, d'équation polaire $r = a\sin 2t / (\cos^3 t + \sin^3 t)$, en 1638 il fut démontré que l'aire de la boucle est $2a^2/3$)

à droite avec la cubique de Tchirnhausen ou courbe du chien $9a(y-2a/3)^2 = x(x - 3a)^2$ ici a = 0,3



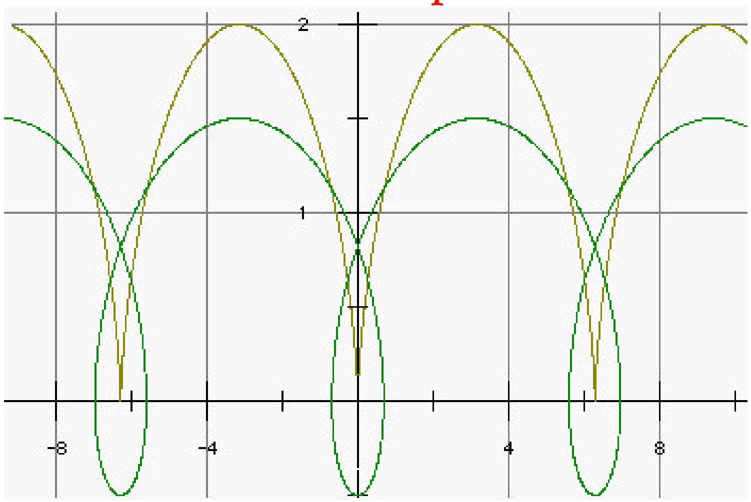
$(x^2+y^2)(y+1) - 2y^2 - 2xy - my + m = 0$ pour $m = -2$ (rouge) à 2 (violette) est l'ensemble des points de contact des tangentes issues de (1, 1) aux cercles d'un faisceau $x^2+y^2 - 2ky + m = 0$



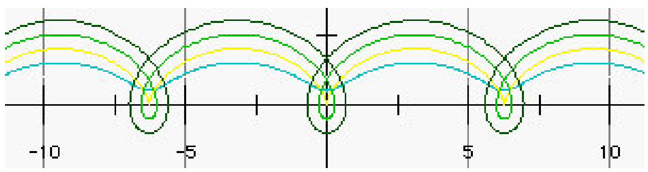


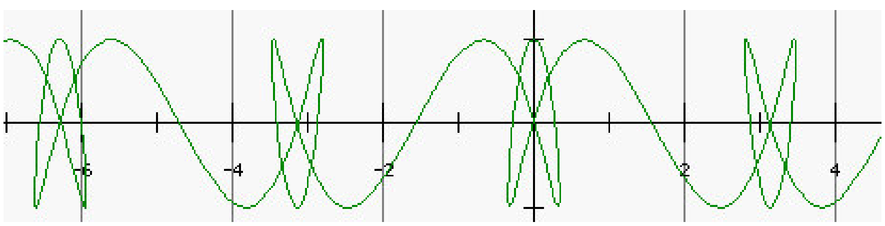
Les ovales de Descartes $MF + nMF' = 2a$ si $FF' = 2c$, si $n = \pm 1$ coniques,
si $n = a/c$ limaçons de Pascal, ici $c = 1$ $a = 2$ $n = 0,5$ (noir), $n = 1$ (bleu),
$n = 2$ (jaune et vert avec $a = 1$), $n = 3$ (orange)
Conchoïdes de Nicomède (conchoïdes de'une droite par rapport à un point extérieur) $r = m + 1/\cos t$

Très belles courbes paramétrées

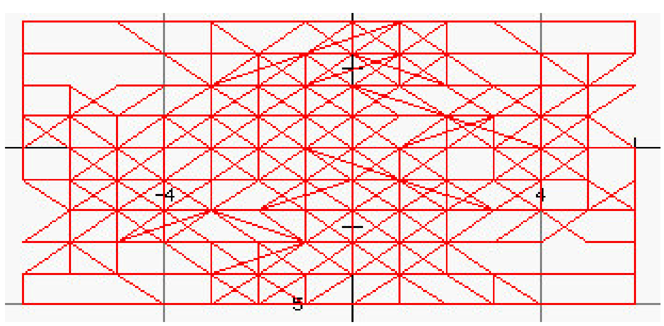


$x = t - \sin t$ $y = 1 - \cos t$ et Cycloïde rallongée $x = t - 2\sin t$ $y = 1/2 - \cos t$

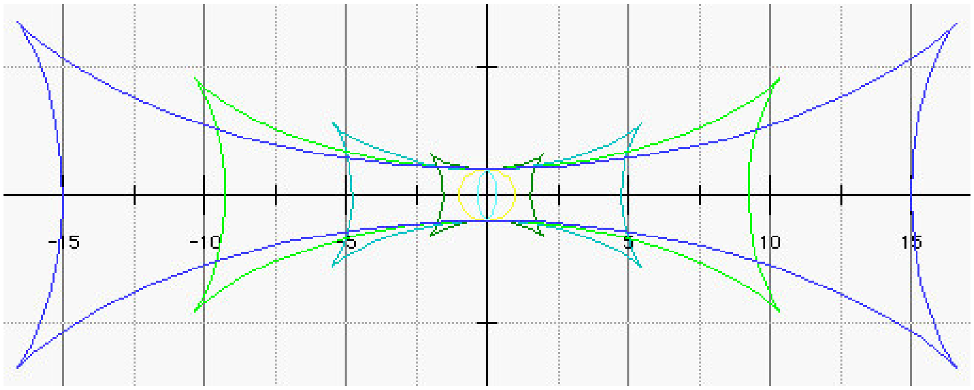




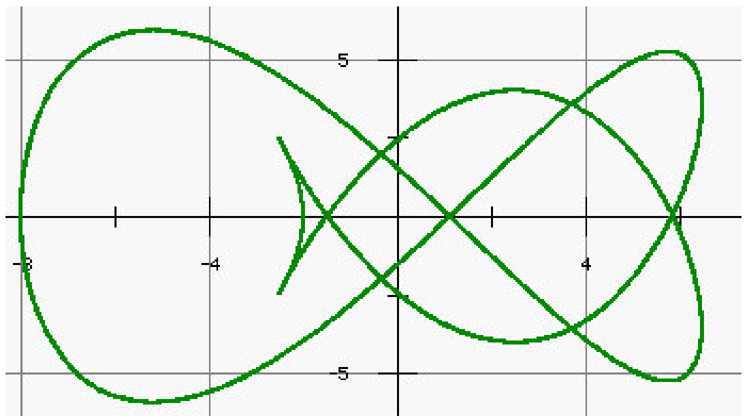
$x = t - \sin 2t$ $y = \cos 5t$



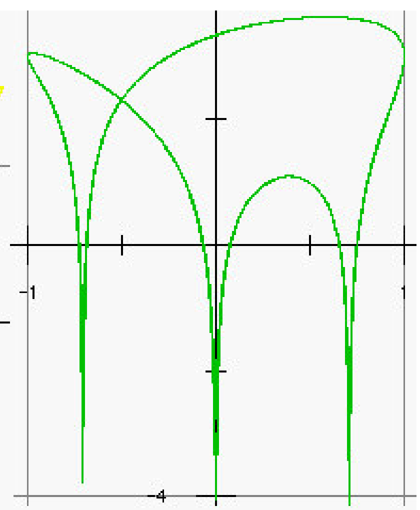
Bizarrerie $x = \text{int}\,[\,3\sin(11t) + 4\cos(23t)]$ $y = \text{int}\,[3\sin(17t) + 2\cos(13t)]$



Courbes de Talbot (antipodaires d'éllipse) $x = (1-2m^2 + m^2\sin^2 t)\sin t \quad y = (1 + m^2\cos^2 t)\cos t$

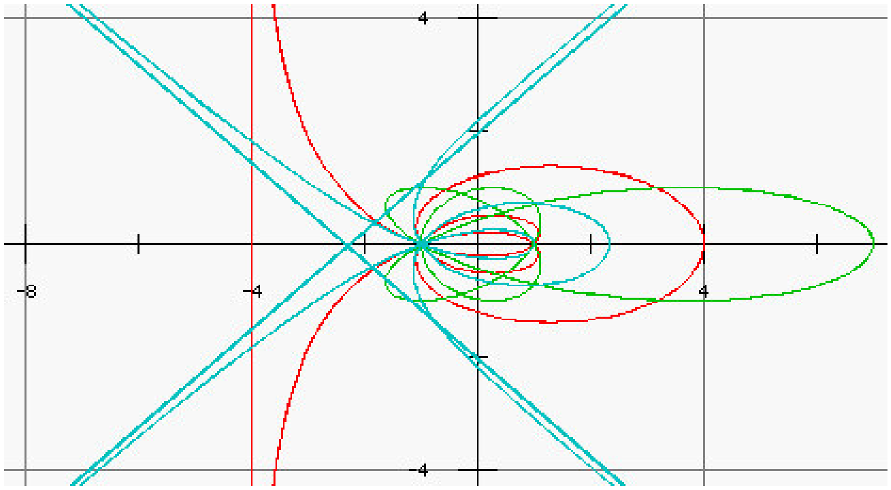


$x = 5\cos 2t - 3\sin 3t \qquad y = -2\cos 5t - 4\sin 4t$



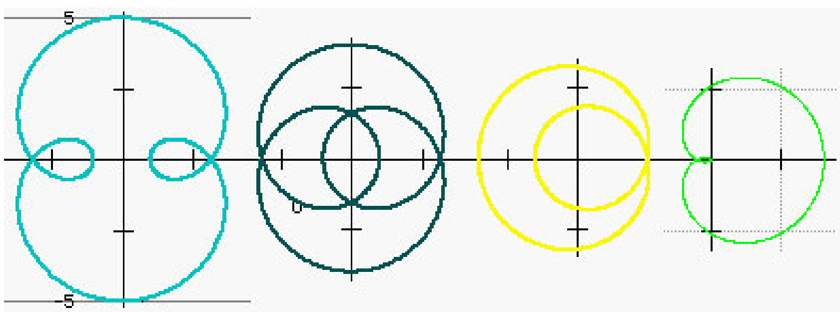
$x = \cos 3t - 2\sin^3 t \quad y = 3 + \ln|\sin 2t - \cos 5t|$

$x = \cos 2t \quad y = 7 + \ln|\sin 3t + \cos t|$



Les élégantes courbes de Plateau $x = \sin(n+m)t / \sin(m-n)t$ $y = \sin nt \sin mt / \sin(m-n)t$
pour m=5, n=3 (rouge), m=6, n=5 (verte), m=10, n=4 (bleue)

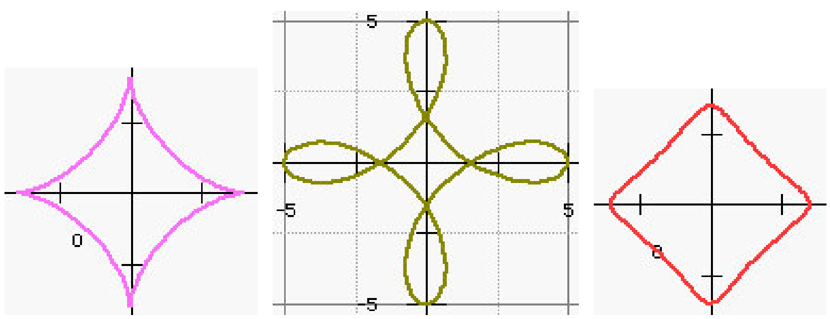
Hypo, épi-cycloïdes et trochoïdes



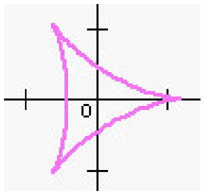
Néphroïdes bien rallongées $x = 3\cos t - 2\cos 3t$ $y = 3\sin t - 2\sin 3t$
et $x = 3\cos t - 5\cos 3t$ $y = 3\sin t - 5\sin 3t$

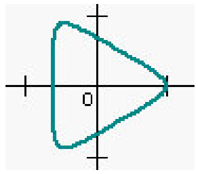
Cardioïde rallongée
$x = 2\cos t - 5\cos 2t$ $y = 2\sin t - 5\sin 2t$

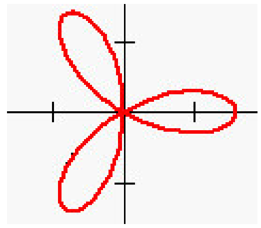
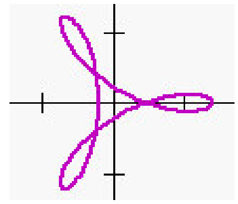
La sextique de Cayley à droite $r = 4a\cos^3(t/3)$ ou $4(x^2+y^2-ax) = 27a^2(x^2+y^2)^2$



Astroïde $x = 3\cos t + \cos 3t$ $y = 3\sin t - \sin 3t$ (aussi $x \sin^3 t$ $y = \cos^3 t$), une allongée
$x = 3\cos t + 2\cos 3t$ $y = 3\sin t - 2\sin 3t$ et une raccourcie $x = 3\cos t + 0{,}5\cos 3t$ $y = 3\sin t - 0{,}5\sin 3t$

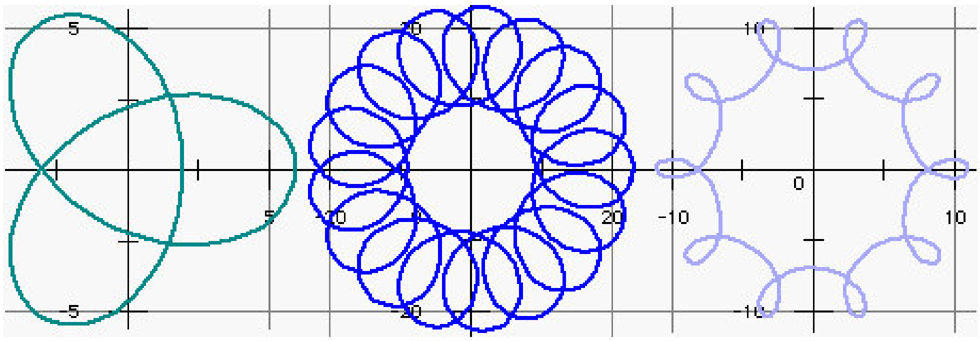




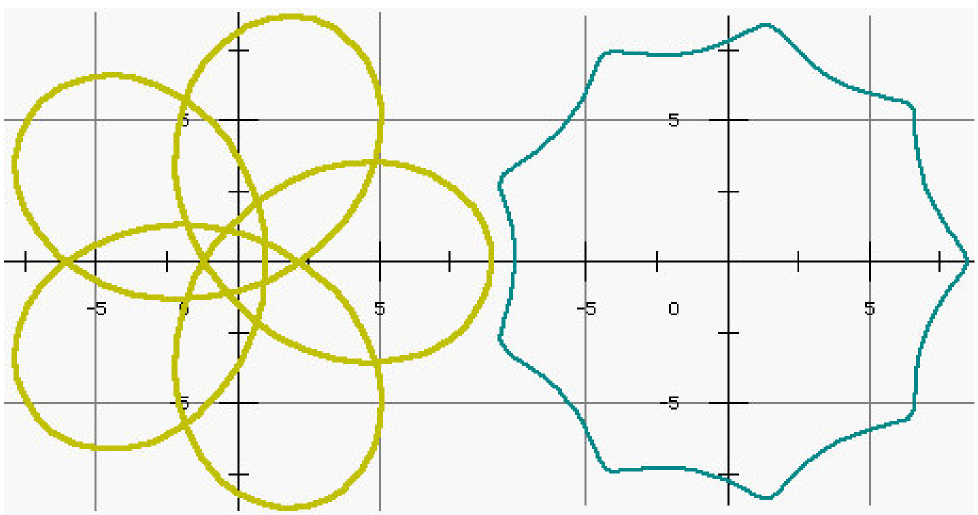
Deltoïde $x = 2\cos t + \cos 2t$ $x = 2\cos t + 0{,}5\cos 2t$ $x = 2\cos t + 2\cos 2t$ $x = 2\cos t + 1{,}5\cos 2t$

$y = 2\sin t - \sin 2t$ $x = 2\sin t - 0{,}5\sin 2t$ $x = 2\sin t - 2\sin 2t$ $x = 2\sin t - 1{,}5\sin 2t$

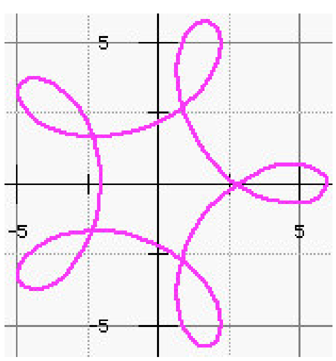


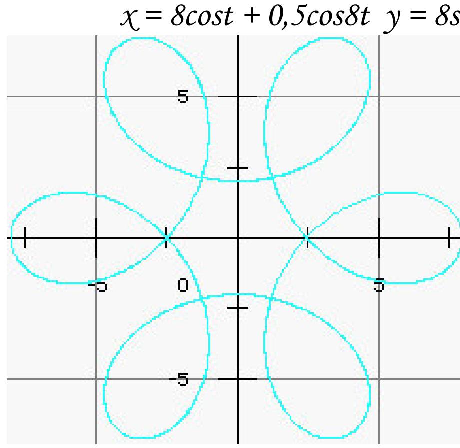
Admirez à gauche les rondeurs de $x = 2\cos t + 4\cos 2t$ $y = 2\sin t - 4\sin 2t$

au centre la folie de $x = 16\cos t + 7\cos 16t$ $y = 16\sin t - 7\sin 16t$ *et à droite* $x = 9\cos t + 2\cos 9t$ $y = 9\sin t - 2\sin 9t$

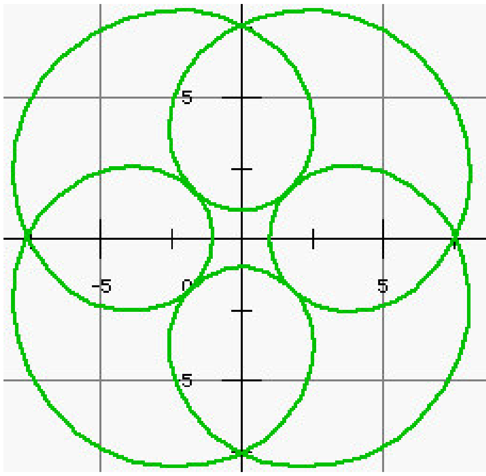


$x = 4\cos t + 5\cos 4t$ $y = 4\sin t - 5\sin 4t$ $x = 8\cos t + 0{,}5\cos 8t$ $y = 8\sin t - 0{,}5\sin 8t$

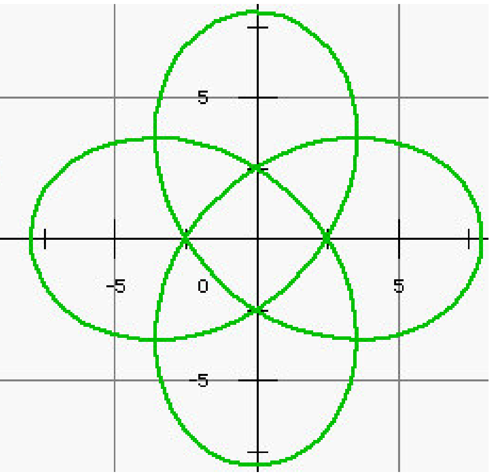




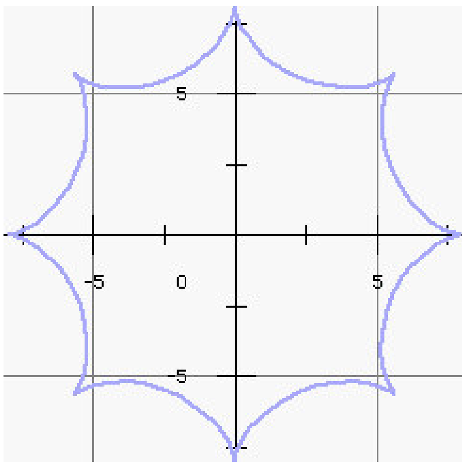
$x = 4\cos t + 2\cos 4t$ $y = 4\sin t - 2\sin 4t$ $x = 5\cos t + 3\cos 5t$ $y = 5\sin t - 3\sin 5t$



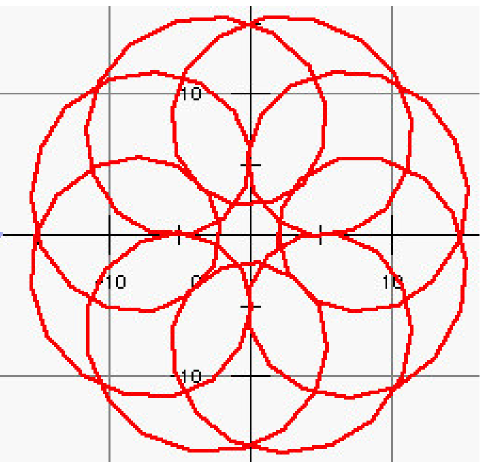
x = 5cost - 4cos5t y = 5sint - 4sin4t



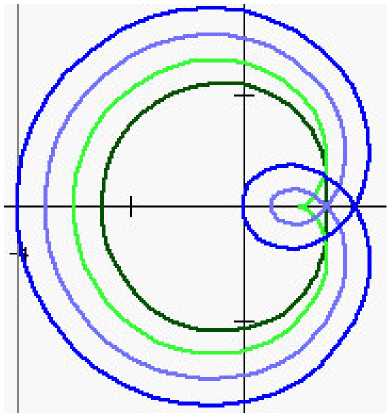
x = 3cost - 5cos3t y = 3sint - 5sin3t



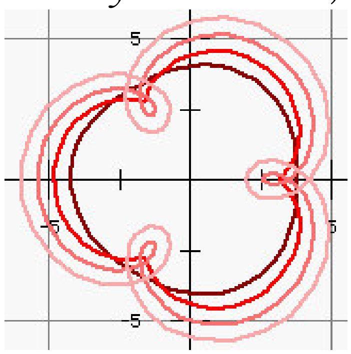
hypocycloïde x = 7cost + cos7t y = 7sint - sin7t



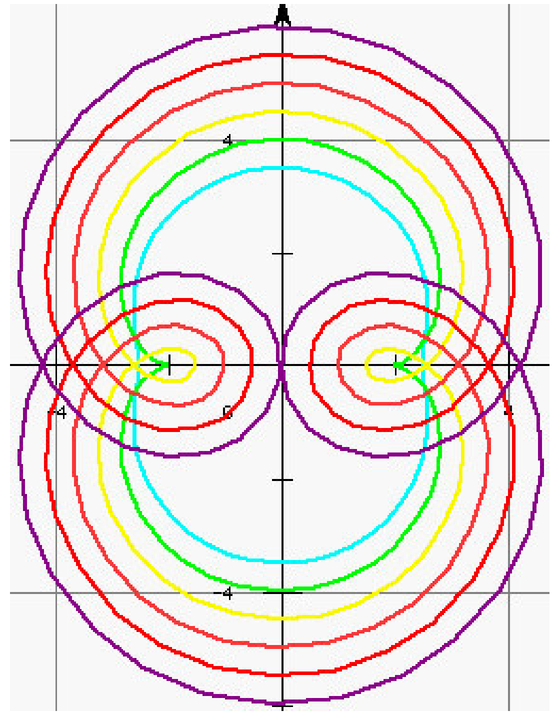
épicycloïde x = 9cost - 7cos9t y = 9sint - 7sin9t



$x = 2\cos t - m\cos 2t \quad y = 2\sin t - m\sin 2t$, m de -1 à 2



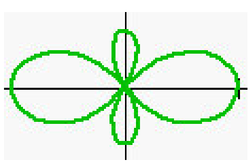
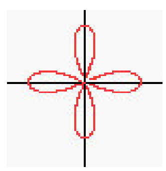
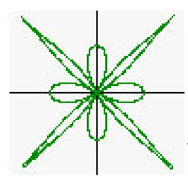
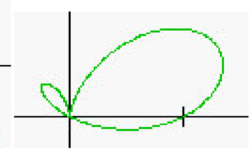
$x = 4\cos t - m\cos 4t \quad y = 4\sin t - m\sin 4t$



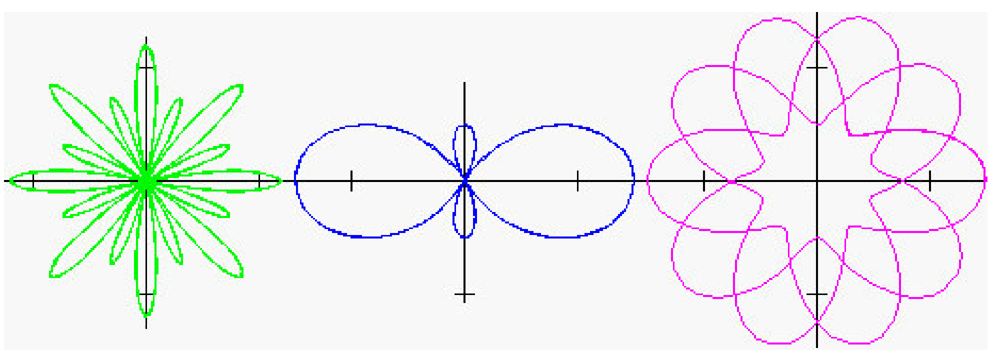
$x = 3\cos t - m\cos 3t \quad y = 3\sin t - m\sin 3t$

pour m = 1 à 3

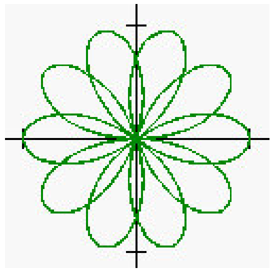
Magnifiques Rosaces

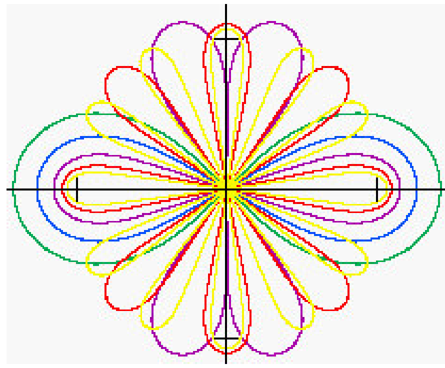
$r = \cos 2t + \cos^2 t = 3\cos^2 t - 1 \quad r = \sqrt{(\cos 4t)} \qquad r = \sqrt{(2|\cos 2t|)} - 1$ Le bifolium de Brocard $r = \cos^2 t(\cos t + 2\sin t)$



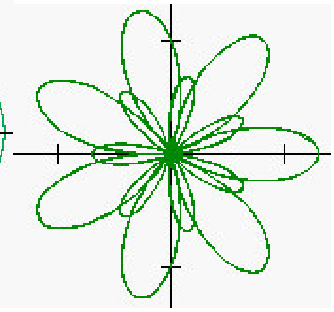
$r = 0{,}2 + \cos 8t \qquad r = 0{,}5 + \cos 2t = 2\cos^2 t - 1/2 \qquad r = 2 + \cos(10t/3)$



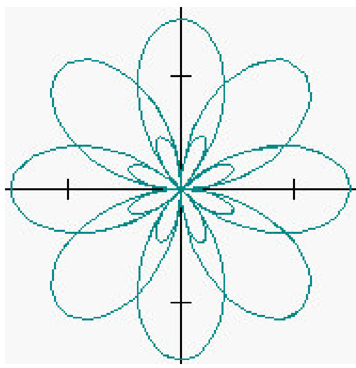
r = sin(5t/2)



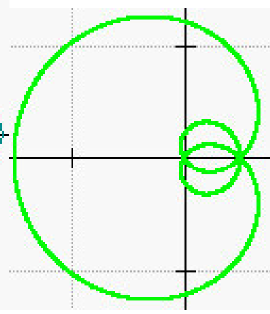
r^n = 2cosnt pour n = 2 (vert), 3 (bleu), 5 (violet), 8 (rouge), 12 (jaune)



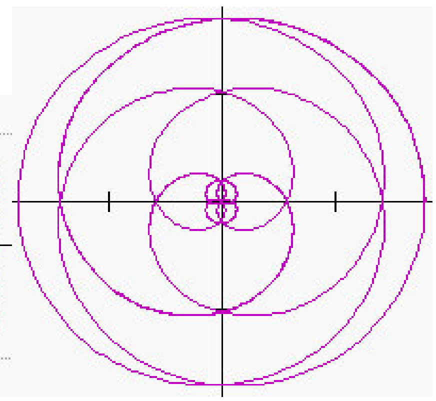
r = 0,3 + cos(7t/2)



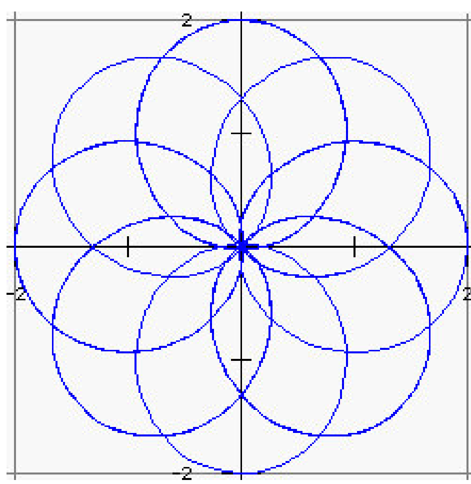
r = 0,5 + cos(8t/3)



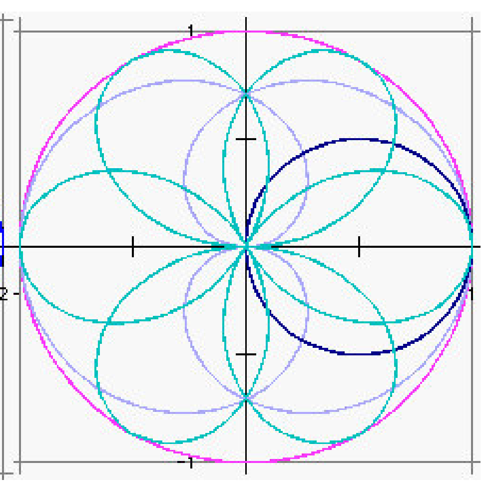
La splendide néphroïde de Freth r = 1 + 2sin(t/2)



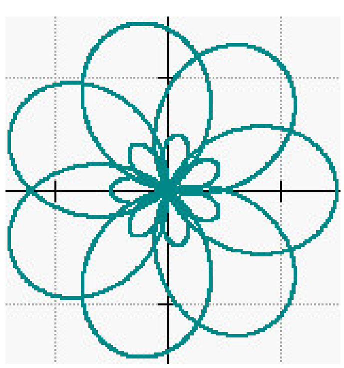
r = 0,8 + cos(2t/7)



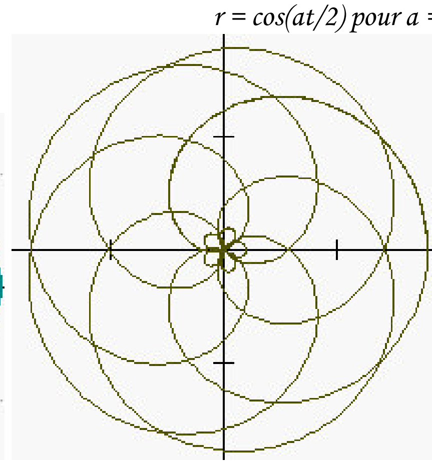
r = 1 + cos(8t/5)



r = cos(at/2) pour a = 0...3

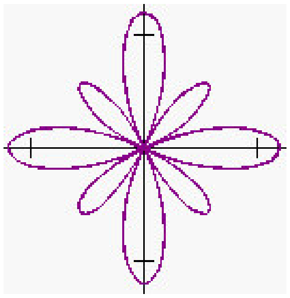


r = 0,5 + sin(7t/4)

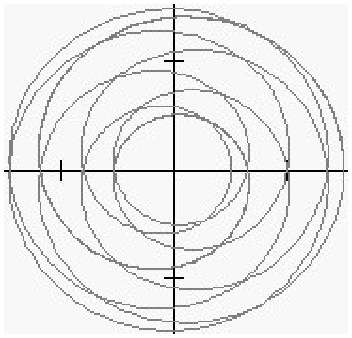


r = 0,8 + cos(5t/7)

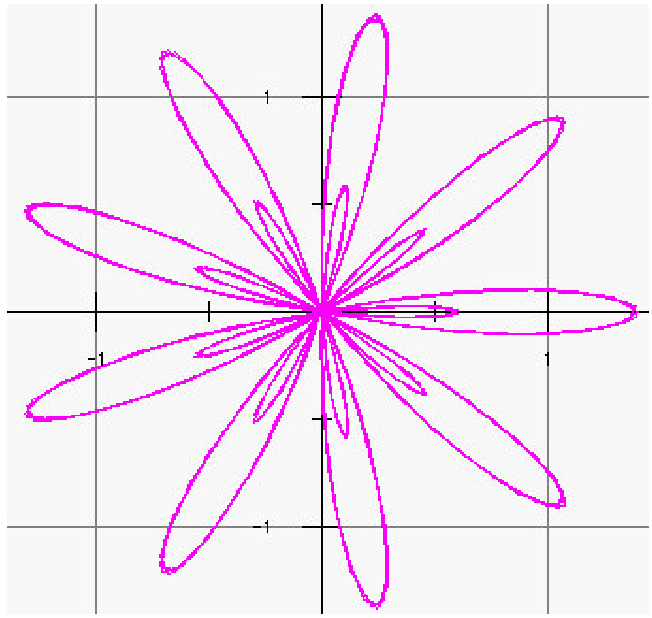
Le petit bifolium r = cost $\sin^2 t$



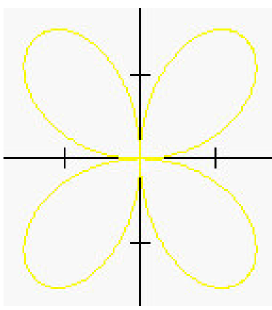
r = 0,2 + cos4t

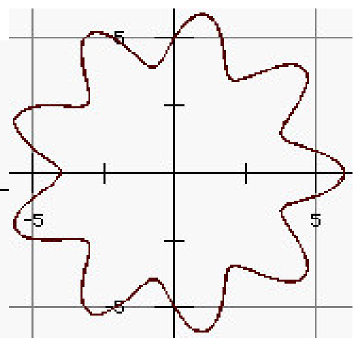


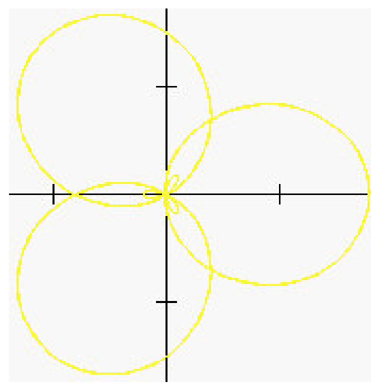
r = 2 + cos(3t/8)



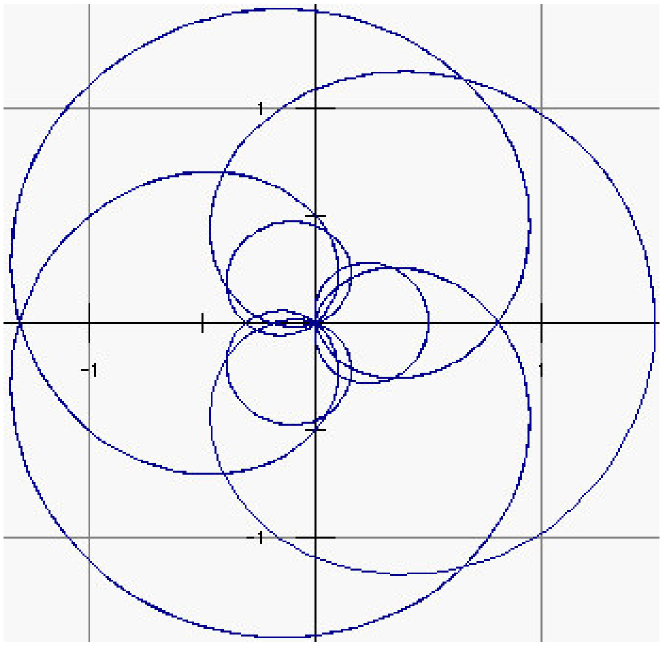
r = 0,4 + cos9t



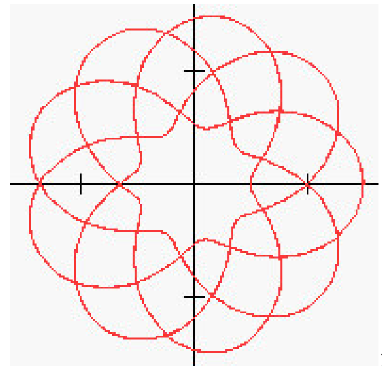




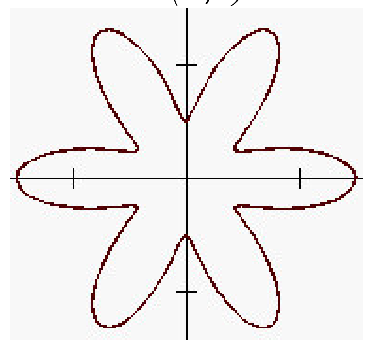
Rosace de Guido-Grandi r = sin2t   *r = 0,5 + cos(9t)*   *r = 0,8 + cos(3t/2)*



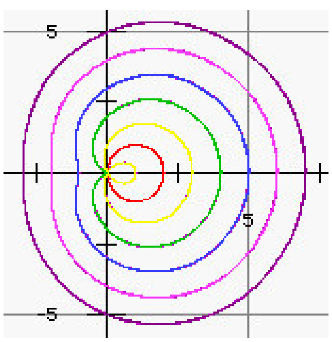
$r = 0,5 + \cos(3t/5)$



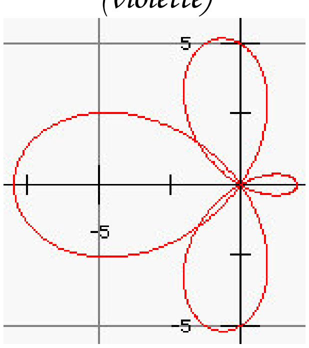
$r = 2 + \cos(9t/4)$



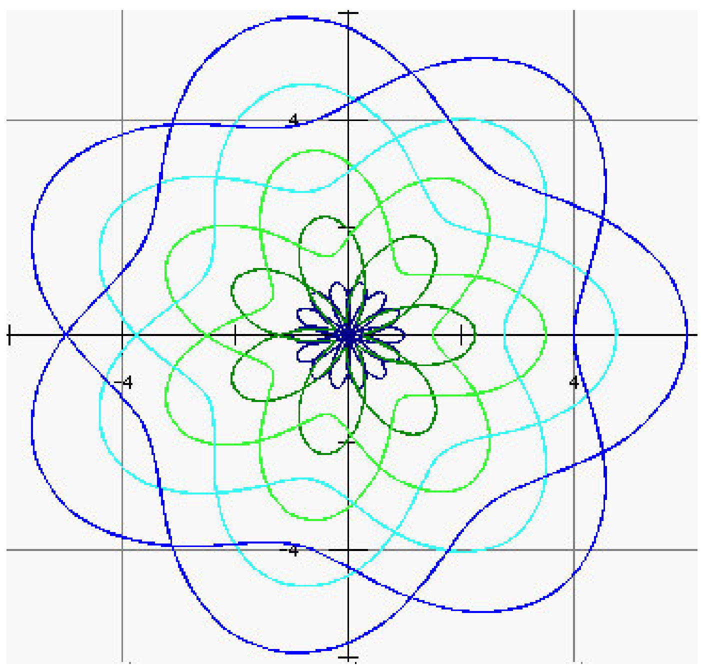
$r = 2 + \cos(6t)$



Les limaçons de Pascal (conchoïdes de cercle) $r = 2\cos t + m$ *pour* $m = 0$ *(cercle), 1 (cardioïde verte), à 5 (violette)*

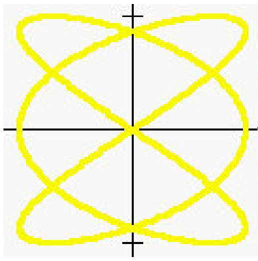
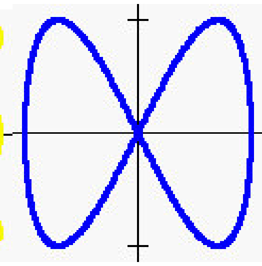
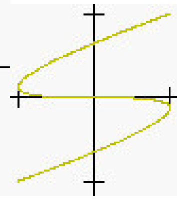
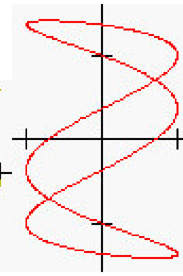
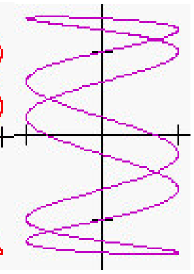


Le scarabée $r = 5\cos 2t - 3\cos t$

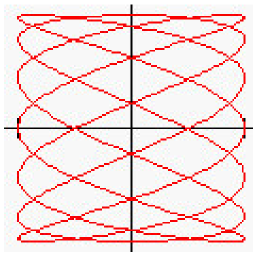
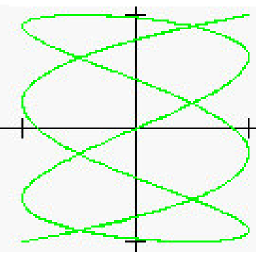
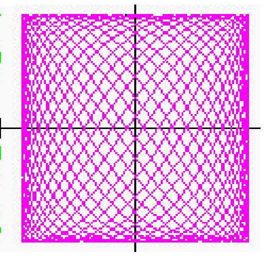


$r = a + \cos(7t/2)$ *pour* $a = 0 \ldots 5$

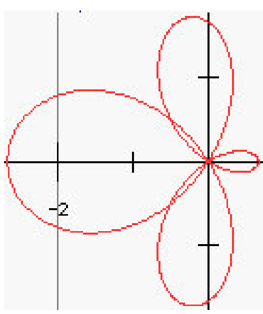
Les inévitables courbes de Lissajoux

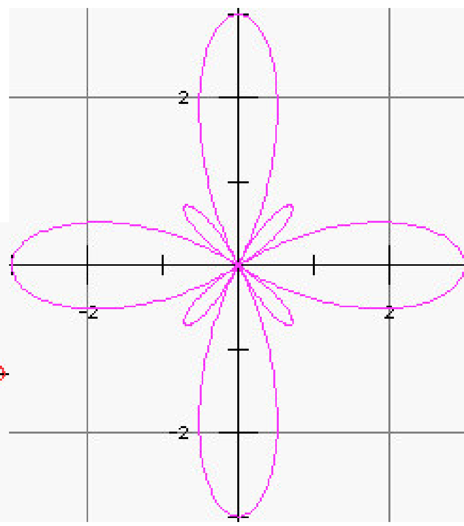






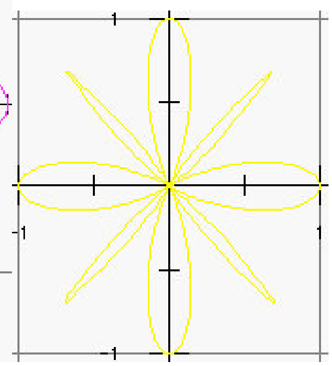
La plus célèbre $x = \cos 3t \quad y = \sin 2t$ *Lemniscate de Gerono* $x = \sin t \quad y = \sin 2t$ *Les virages* $x = \cos 3t \quad y = \cos^3 t$ *et enfin* $x = \cos 3t \quad y = \cos t + \sin t$ $\quad x = \cos 5t \quad y = \cos t + \sin t$

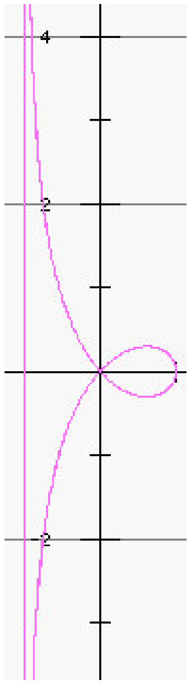
$x = \sin 7t \quad y = \cos 3t$ $\qquad x = \sin 7t \quad y = \sin 3t$ $\qquad x = \sin 17t \quad y = \cos 23t$

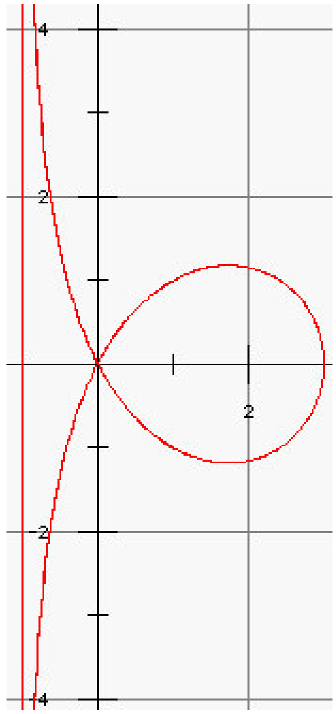


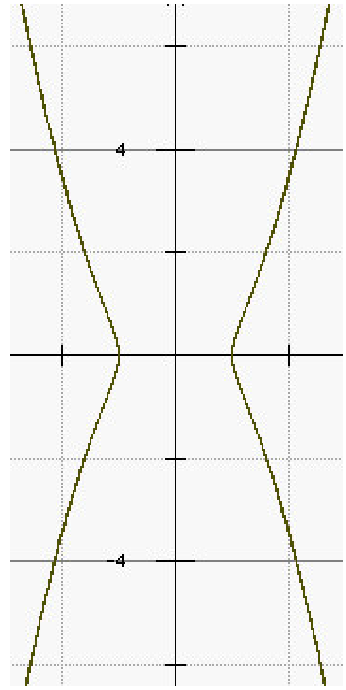




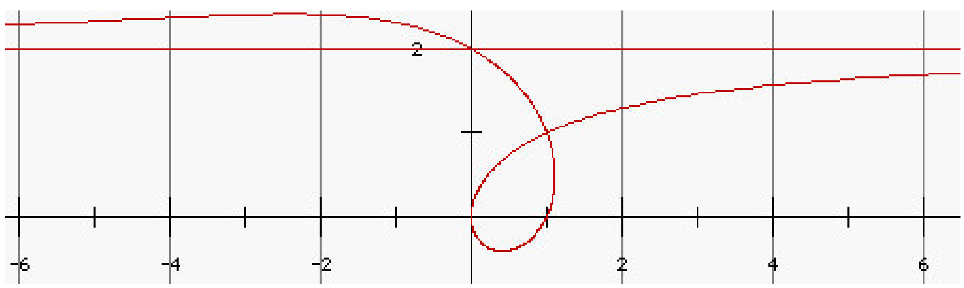
$r = sqr(2|\cos 2t|) - 1$ $\qquad r = (2|\cos 2t - 1|)^2$ $\qquad r = (5/3)\cos 2t - \cos t$



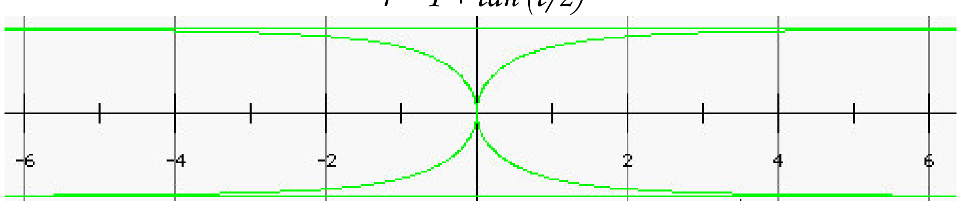




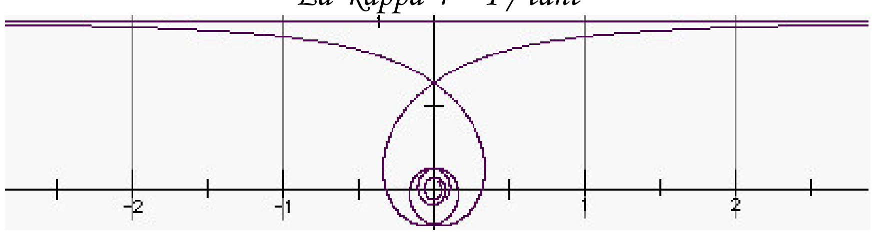
r = cos2t / cost (strophoïde) *r = 4cos2t - 1/cost* *le "kampyle" d'Eudoxe r = 1/cos^{2}t*



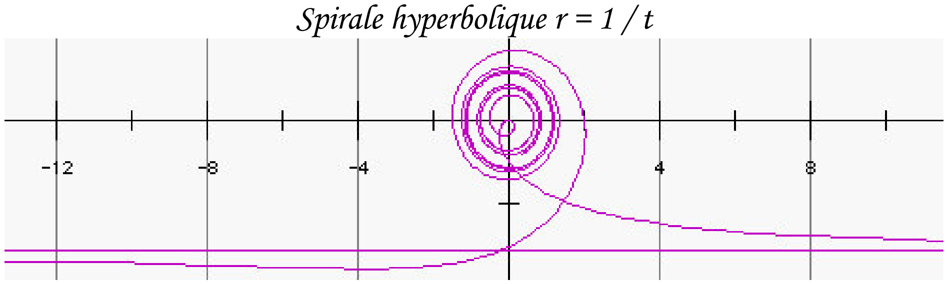
r = 1 + tan (t/2)



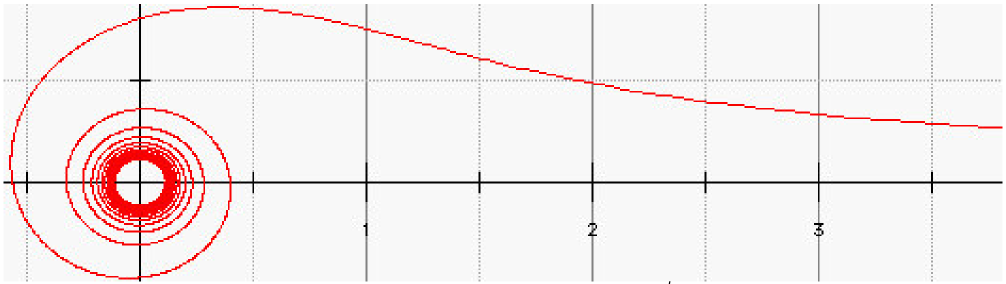
La "kappa" r = 1 / tant



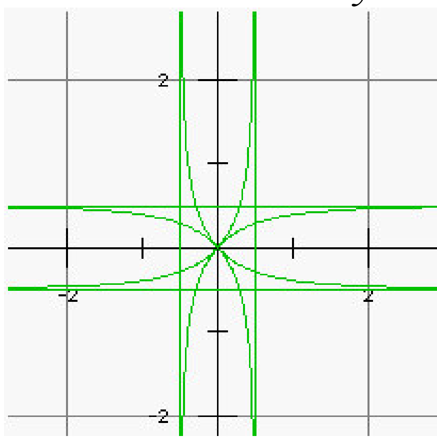
Spirale hyperbolique r = 1 / t

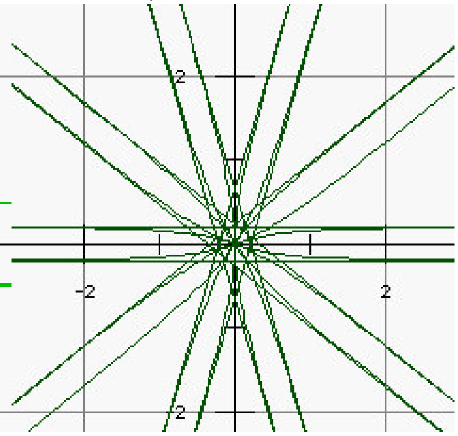


r = t / (t - π)

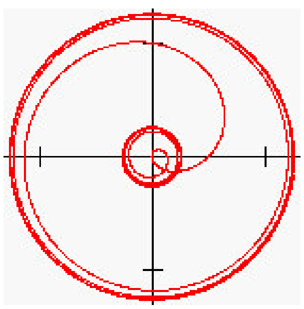


L'incroyable "lituus" $r = 1/\sqrt{t}$

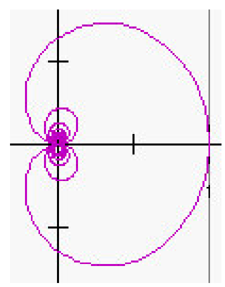




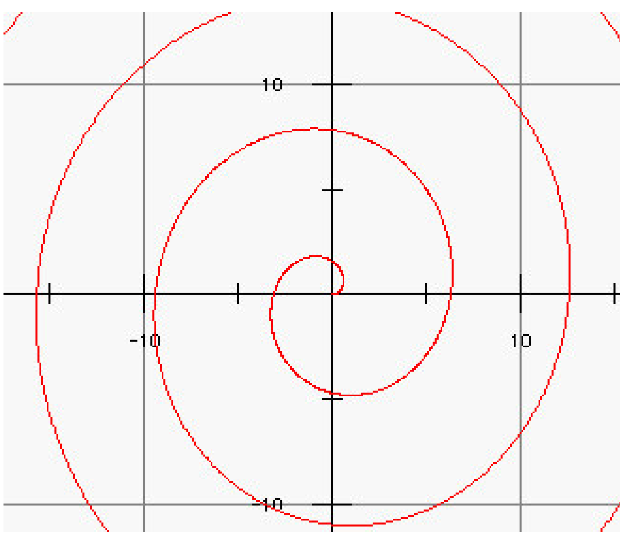
$r = 1 / \tan 2t$ $\qquad$ $r = 1/\tan 5t$



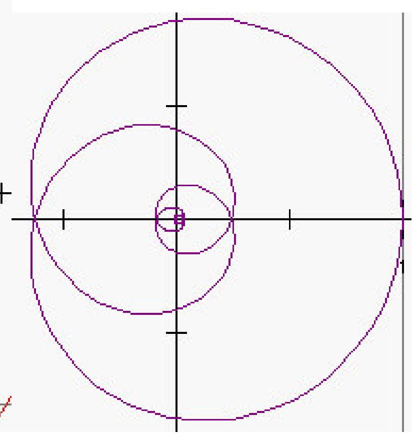
r = 1 + Atant et ses 2 cercles asymptotes



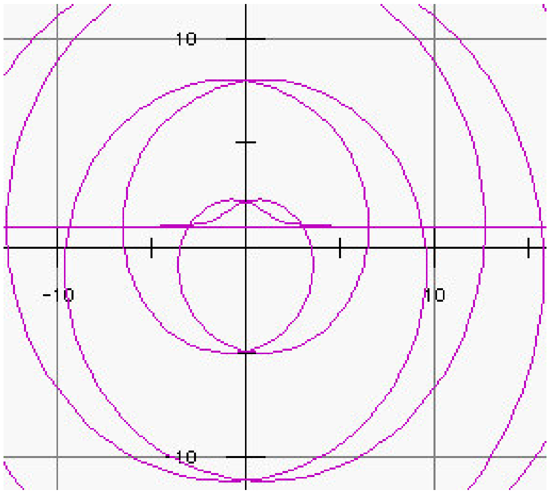
La cochléoïde de Falkenburg r = sint / t (eh oui ça existe)



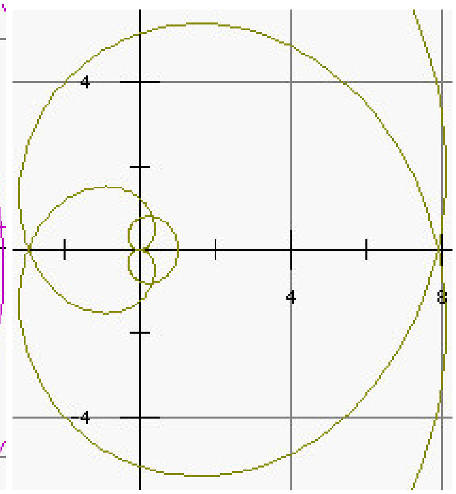
Spirale d'Archimède r = t pour t > 0



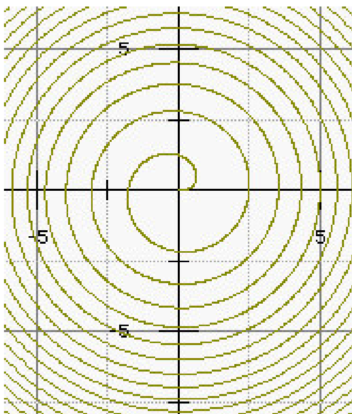
La spirale de Poinsot r = 1 / ch(t/3)



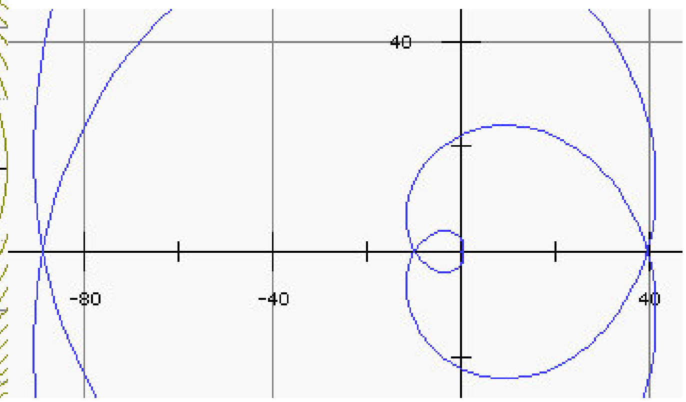
$r = t + 1/t$ et son asymptote $y = 1$



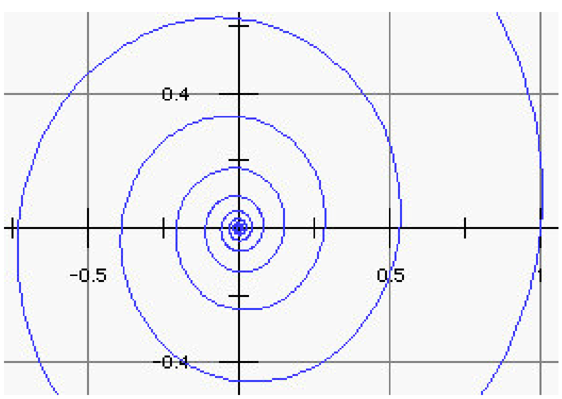
$r = 1 - 0,1t^2$



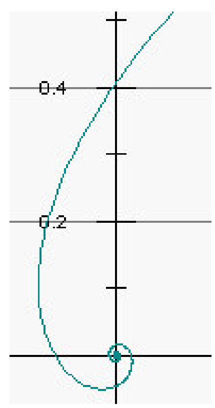
Spirale de Fermat $r = \sqrt{t}$



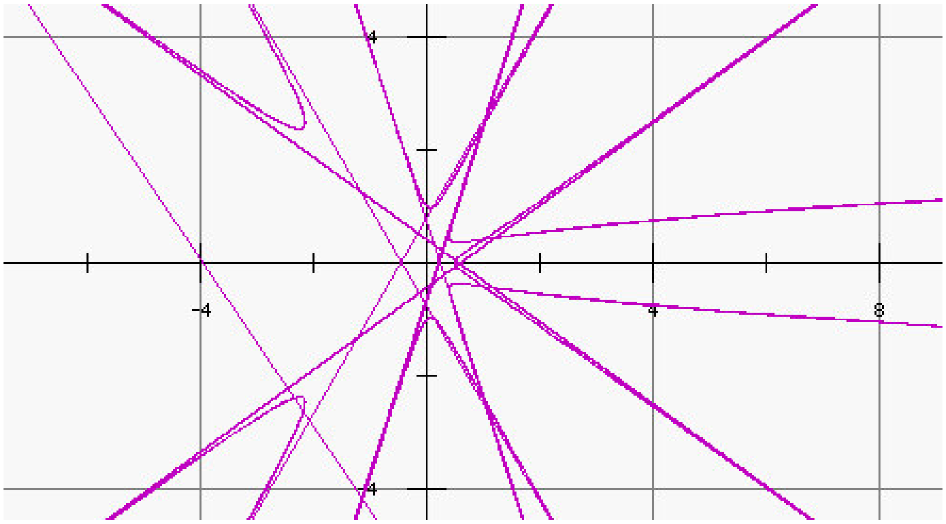
Spirale parabolique de Galilée $r = t^2$



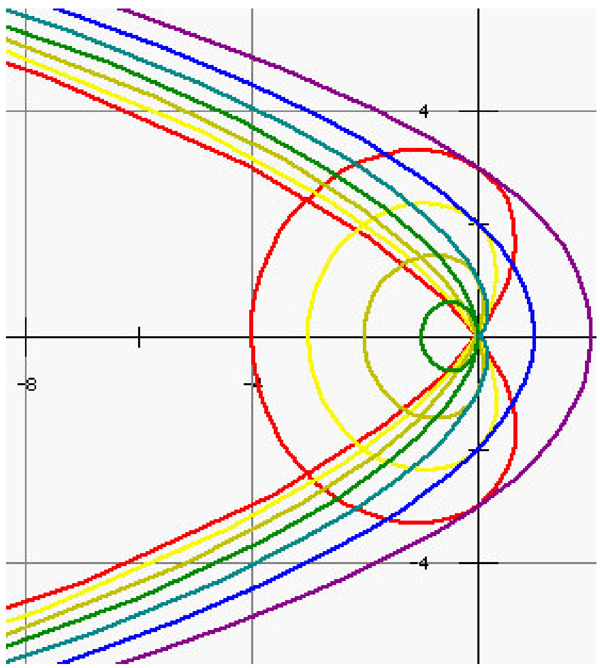
Spirale logarithmique $r = exp(0,1t)$



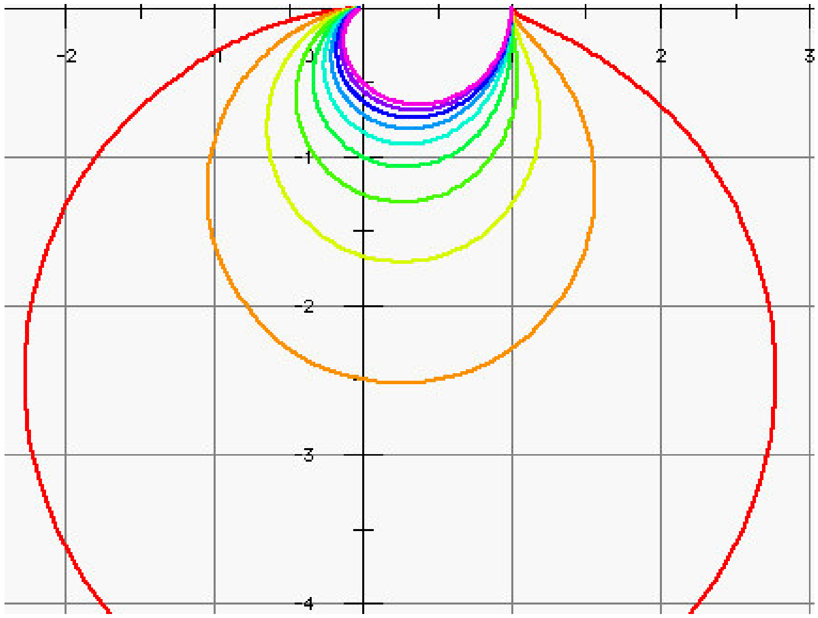
$r = 1 / t^2$



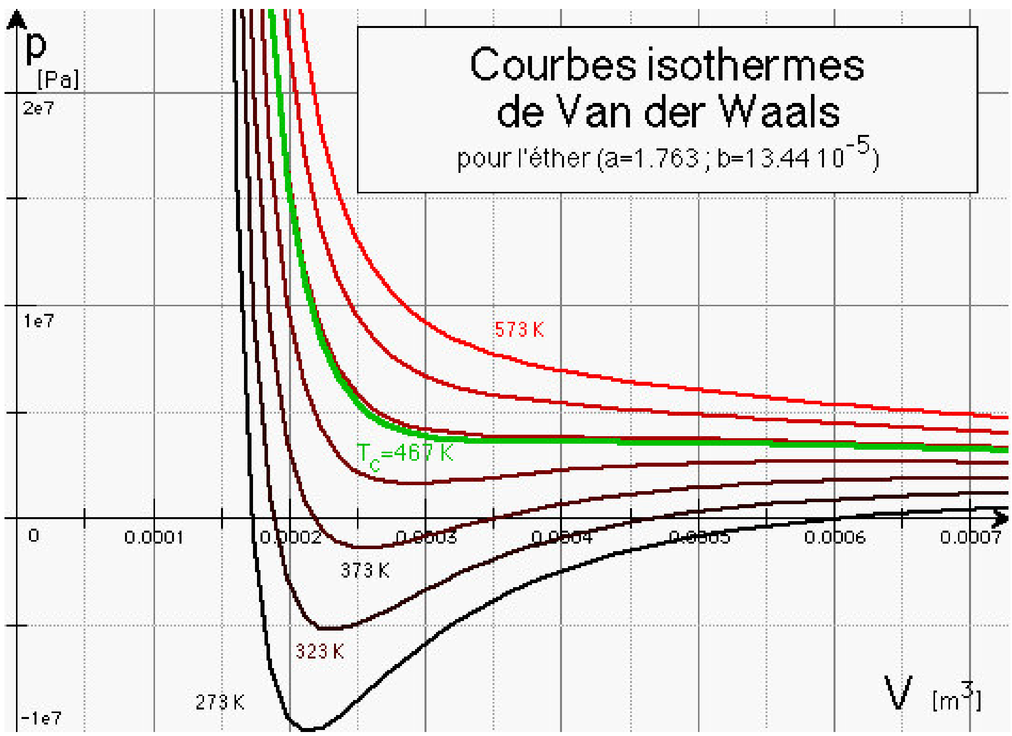
r = 1 / (cost + cos4t) et ses asymptotes d'après Lelong-Ferrand



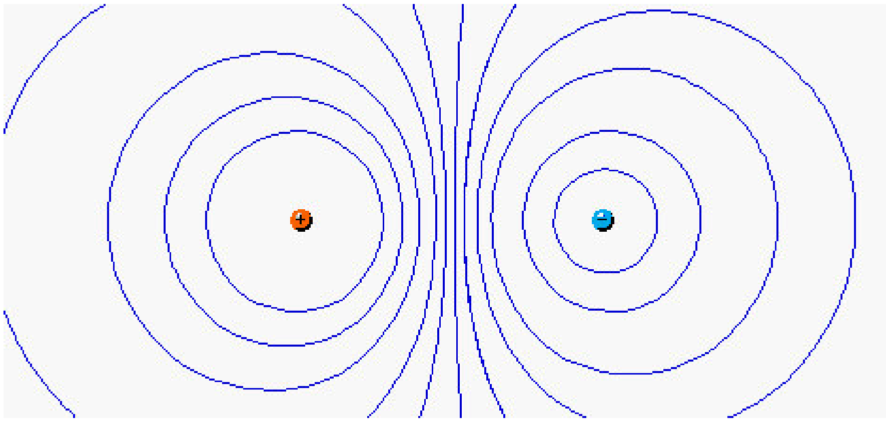
Conchoïdes de parabole r = m + 2/(1 + cost) pour m de -5 (rouge) à 1 (violette)

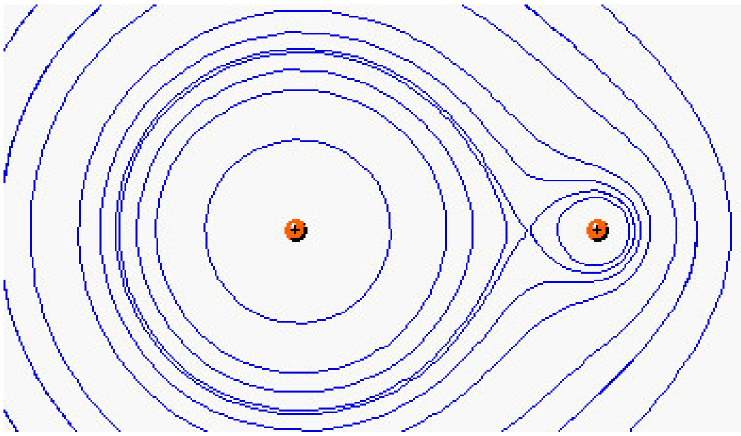


z = 1/((1 - t²) + 2iat) pour a = 0,1 à 1

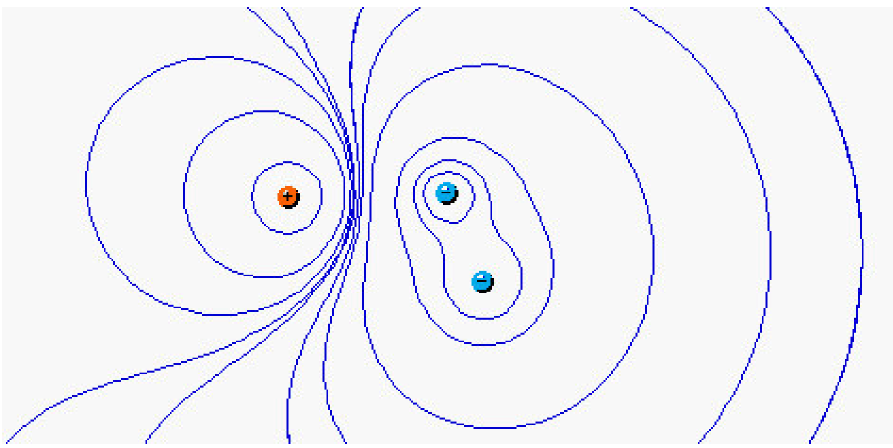


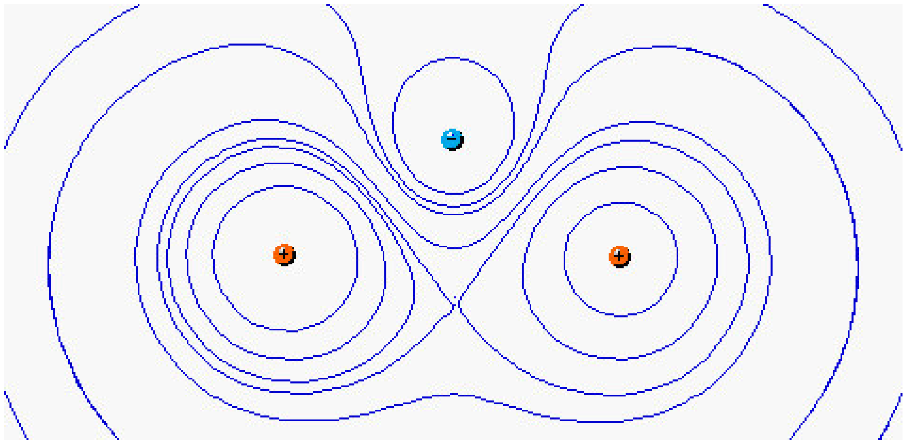
Intermède sur les lignes équipotentielles et lignes de champ

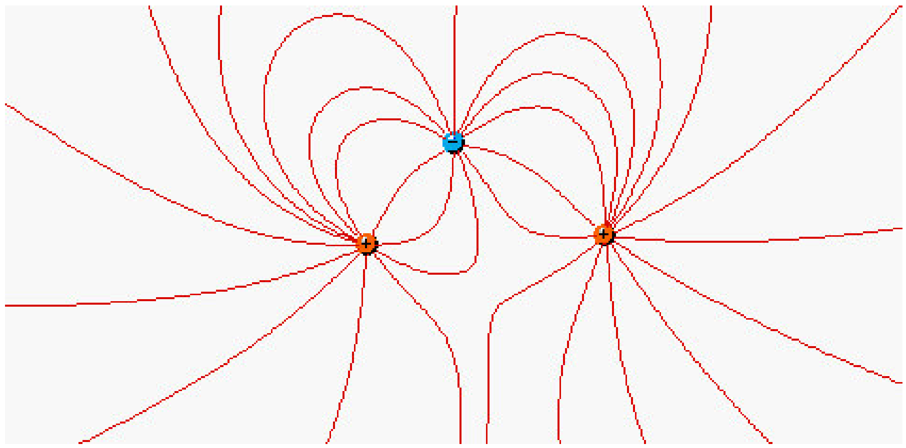


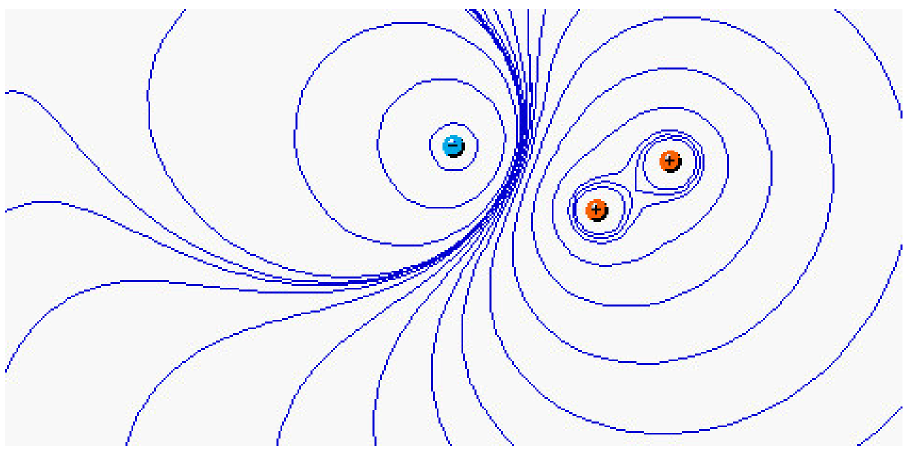


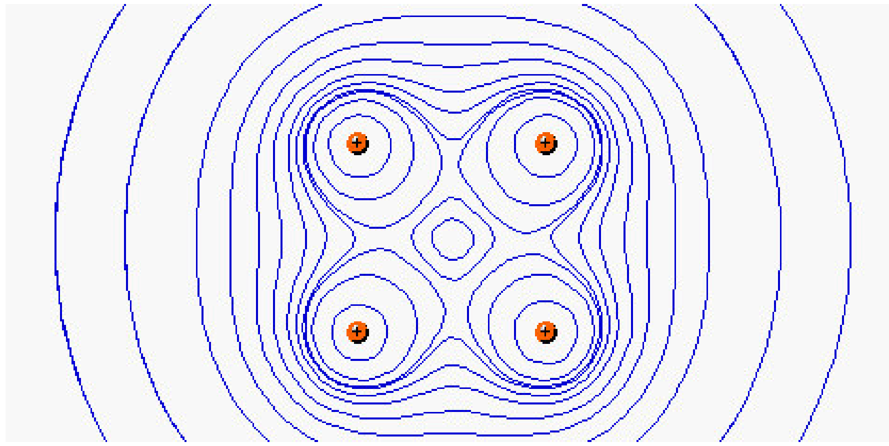
La charge de gauche est dix fois plus grande, le "lobe de Roche" est la ligne ayant un point double.

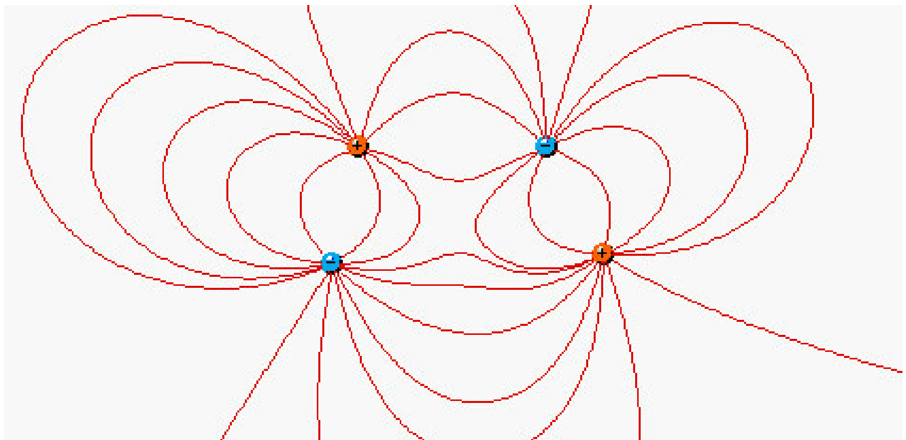


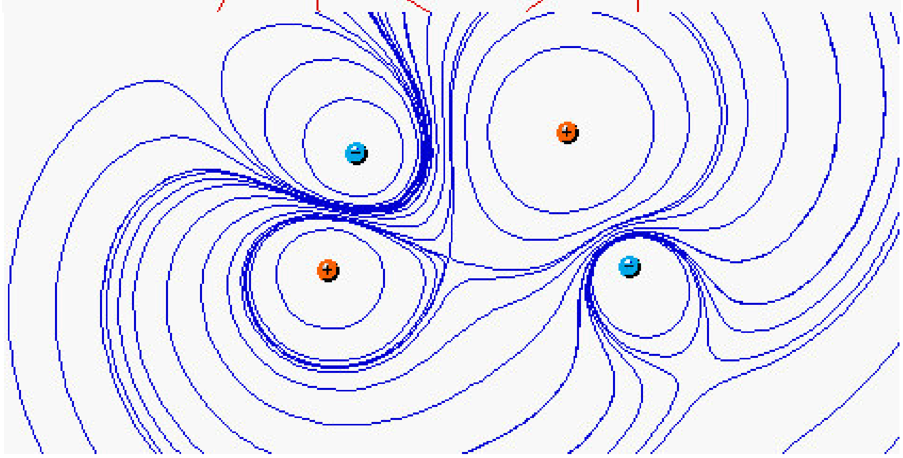


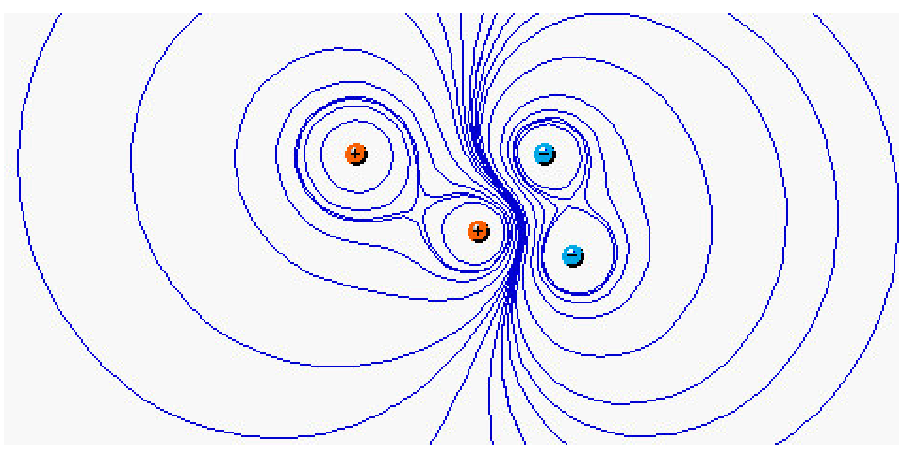


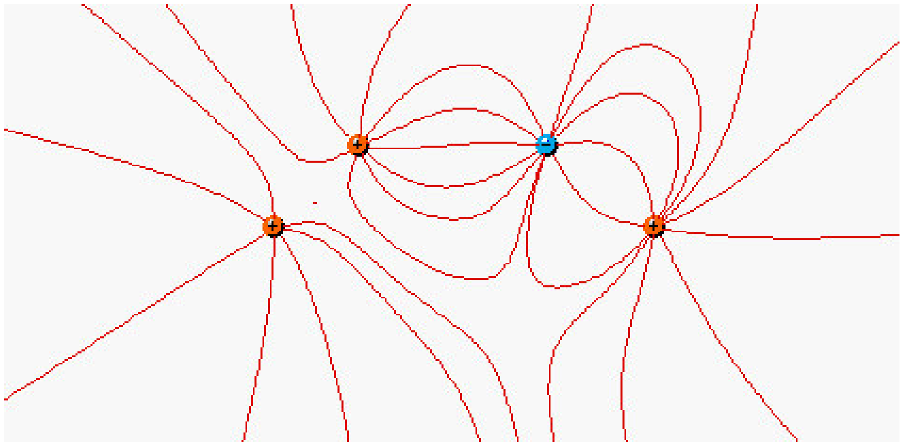


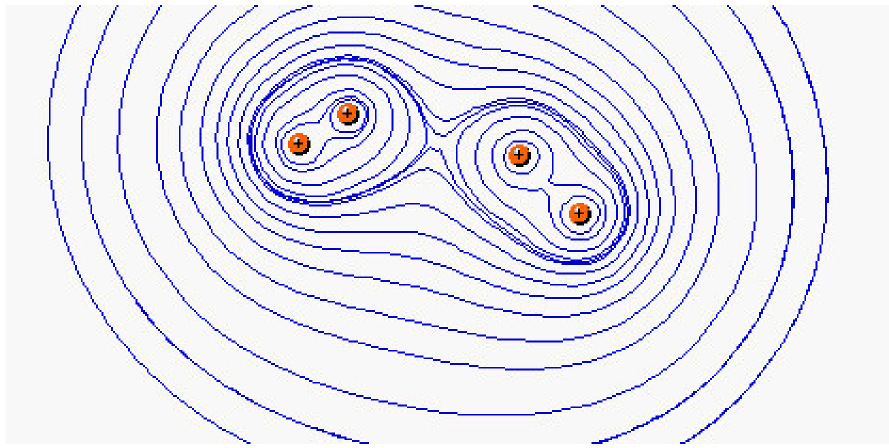


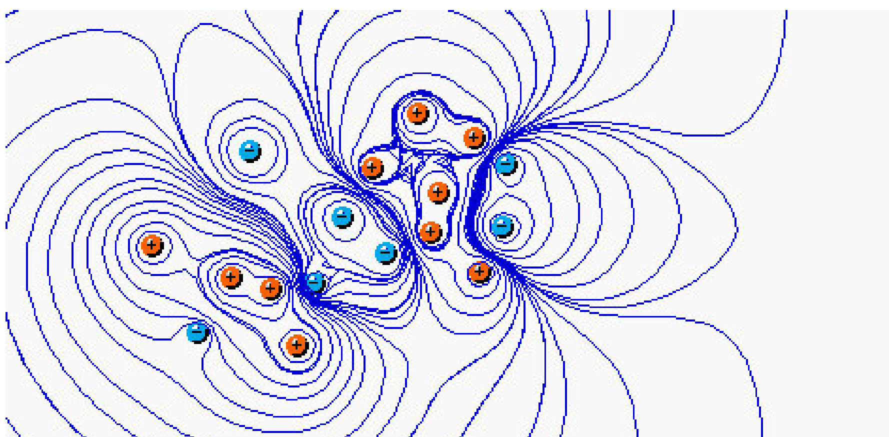


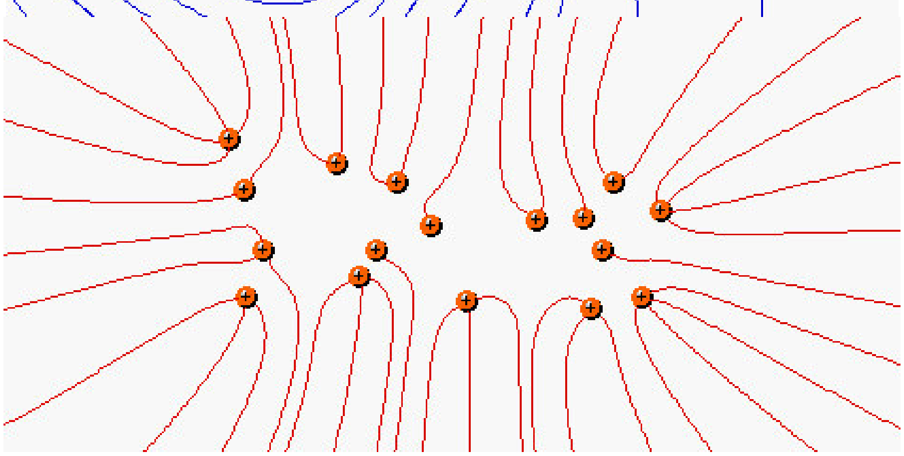


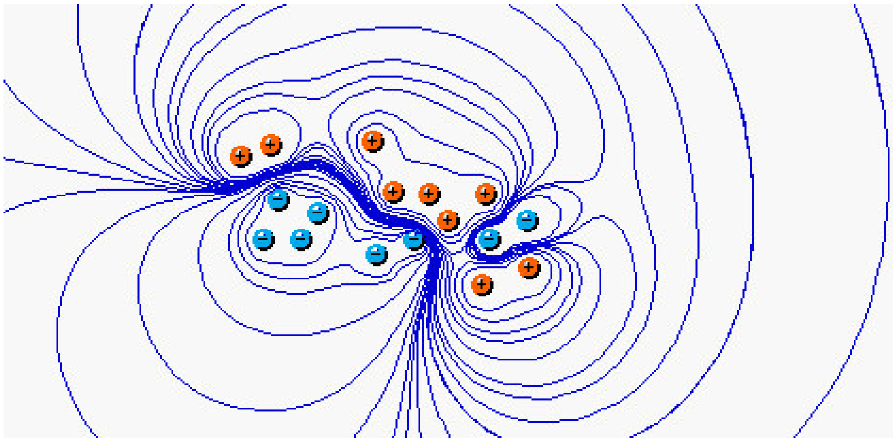




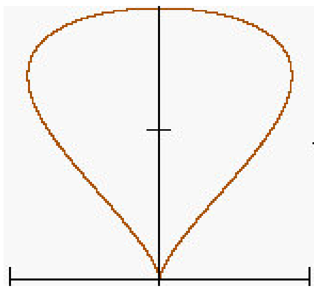


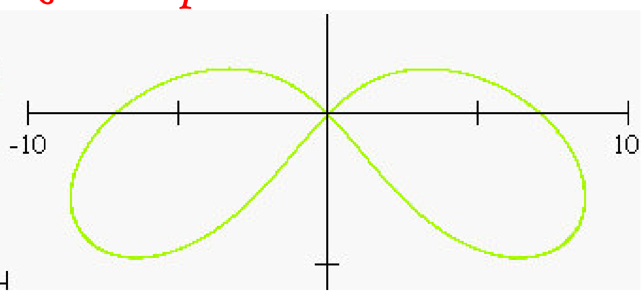




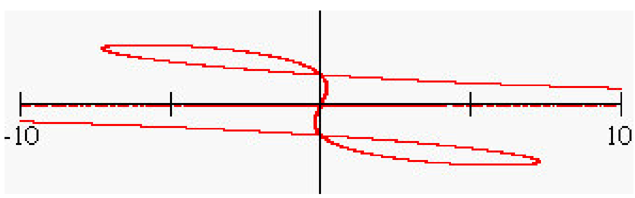


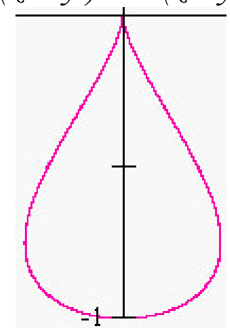
Relations planaires



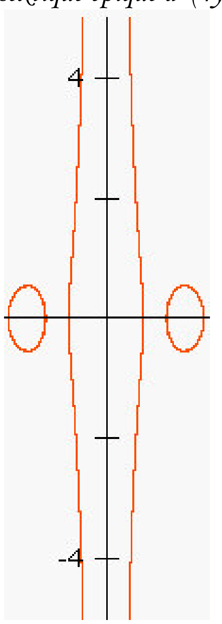


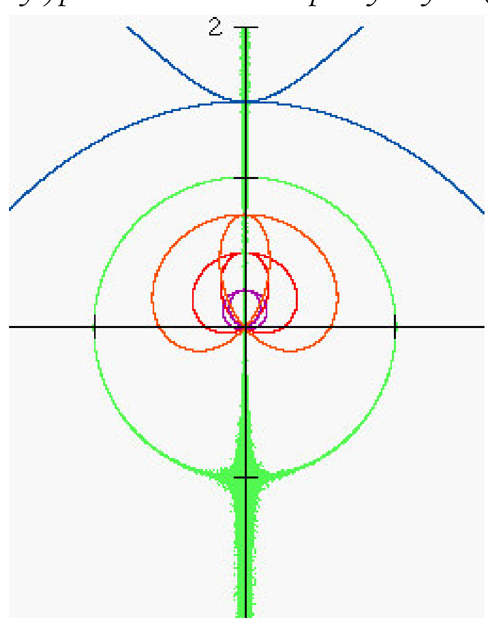
La poire de Wallis $ax^2 = y^2y(b-y)$ de sommet en (0, b) *La besace de Cramer $(x^2 + y^2)^2 = 50(x^2 - y^2) - 16yx^2$*



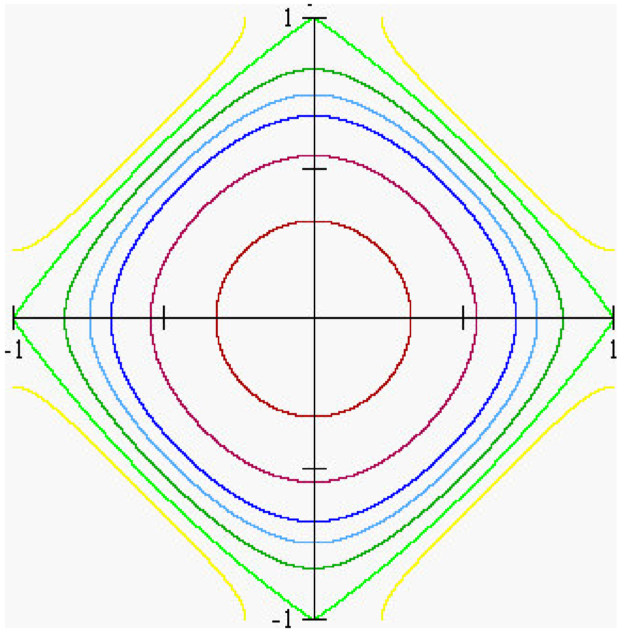


Une sextique épique $a^2(4y^2 + xy - a^2)^2 = (4y^2 - a^2)^2(a^2 - y^2)$ pour a = 3 *Encore la poire $y^4 + y^3 + x^2 = 0$*



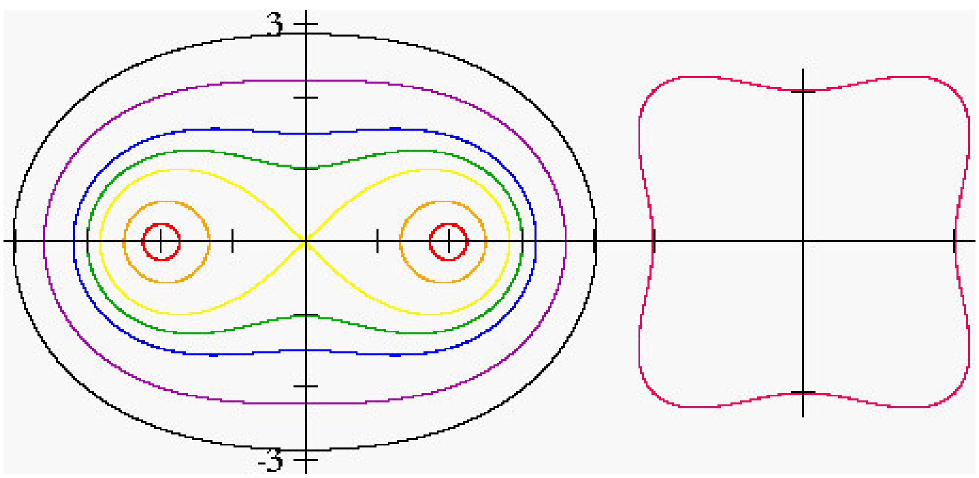


L'atriphtaloïde (non mortelle) $x^4(x^2 + y^2) = (2x^2 - 1)^2$ *Courbes de Jerabek $m^2(x^2 + y^2)(y - m)^2 = (x^2 + y^2 - my)^2$ avec m = 0,25 (violet) 0,5 (rouge) 0,75 (orange) 1 (vert) 1,5 (bleu)*



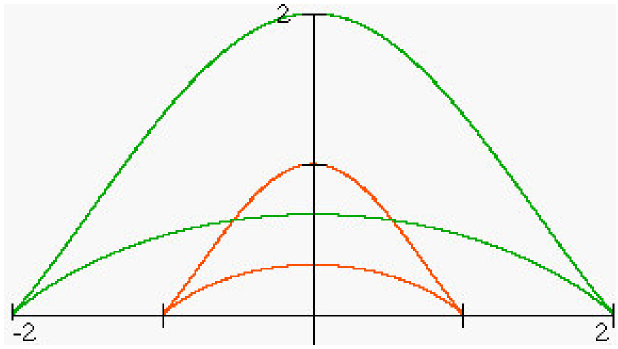
Les quartiques de Plücker $(x^2-1)^2 + (y^2-1)^2 = 0{,}9$ (jaune) à 1,9 (rouge)

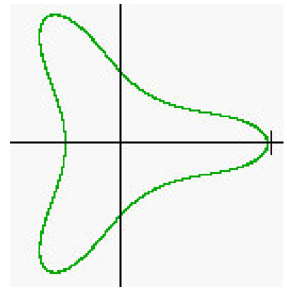
La célèbrissime Lemniscate de Bernoulli sur son lit d'ovales de Cassini



$(x^2+y^2+c^2)^2 = a^4 + 4c^2x^2$, ici les foyers sont en $c = \pm 2$, lemniscate si $a = c$ ($r^2 = 2c^2\cos 2t$, inverse d'une hyperbole équilatère par rapport à son centre), deux parties si $a > c$

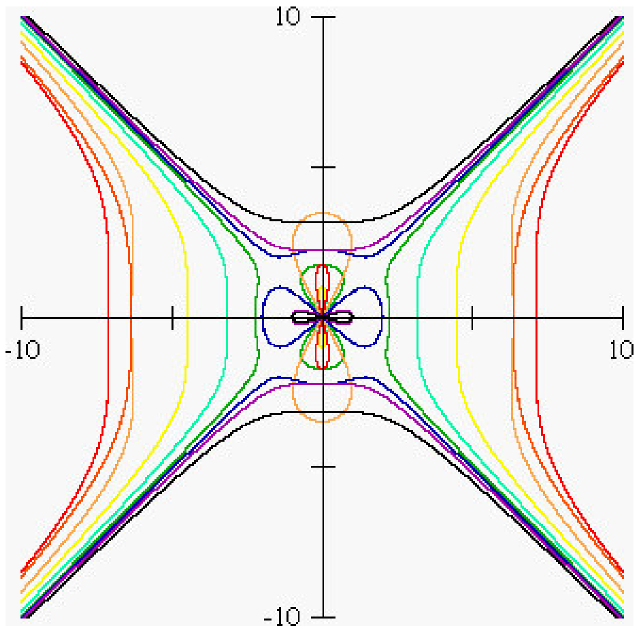
A droite, une magnifique quartique $(x^2+y^2)^2 = m^2(x^2-y^2)$ pour $m = 1$, $r^2 = m^2 + \cos 2t$



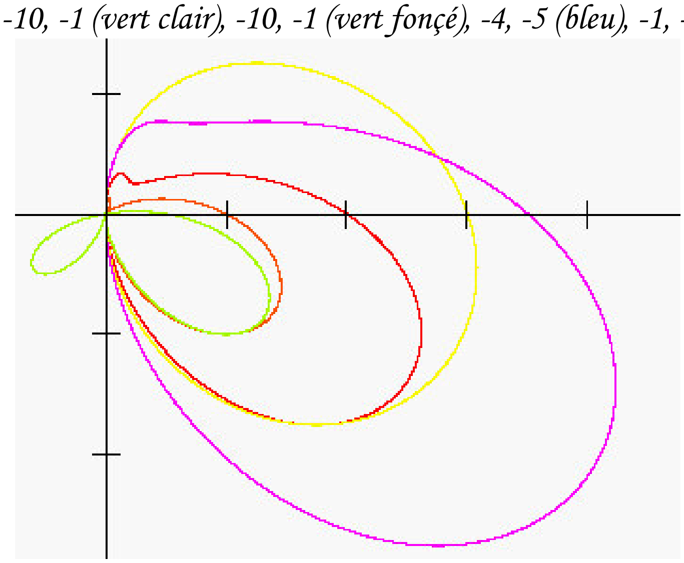


Le bicorne de Sylvester-Cayley $y^2(a^2 - x^2) = (x^2 + 2ay - a^2)^2$ pour $a = 1$ (orange) et 2 (vert)

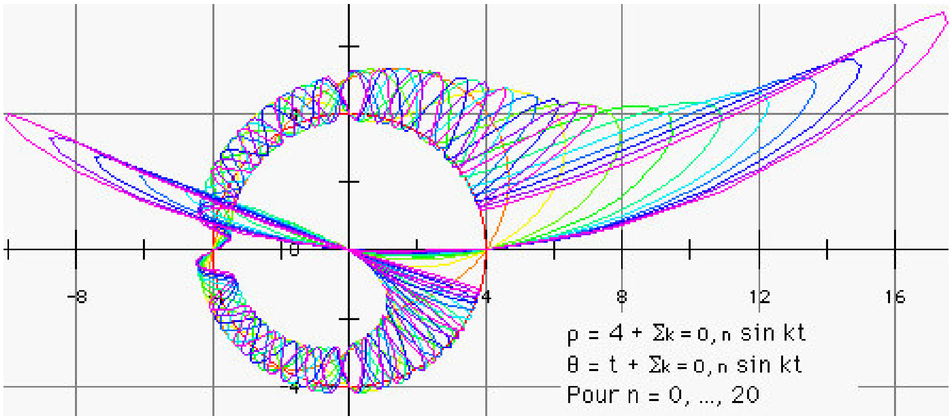
La quartique de Loriga (étudiée lors des innondations de 1910) $(x^2+y^2)^2 - 2ax(x^2-3y^2) + a^2(x^2+y^2) = a^4$

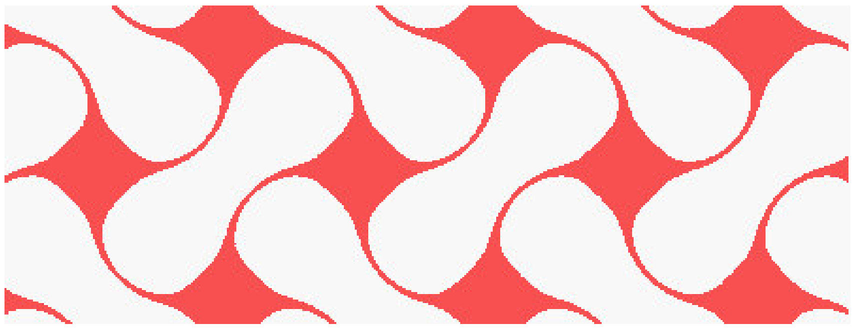


Courbes du diable de Cramer $x^2(a + x^2) = y^2(b + y^2)$ avec a, b = -50, -3 (rouge), -50, -3 (orange), -40, -12 (orange clair), -20, -1 (jaune), -10, -1 (vert clair), -10, -1 (vert fonçé), -4, -5 (bleu), -1, -5 (violet, -1, -10 (noir)

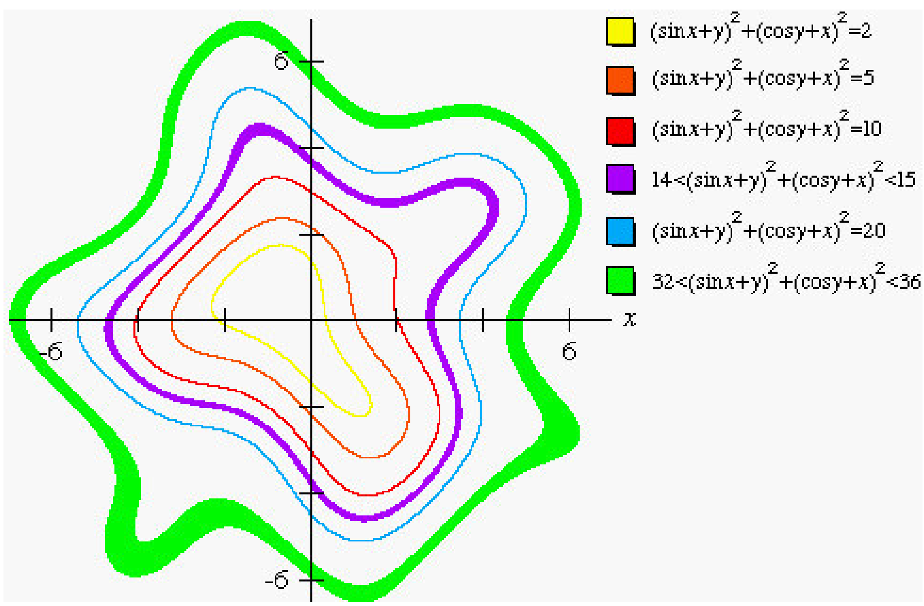


Les trifoliums de Longchamps et Brocard $(x^2+y^2)^2 = ax(x^2-y^2) - bx^2y$ (petit rapport avec les lorgnons de Cramer) pour (a, b) = 3, 1 (jaune), 1, 2 (orange), 2, 3 (rouge), 0,5 3 (vert), 3,5 4 (violet)

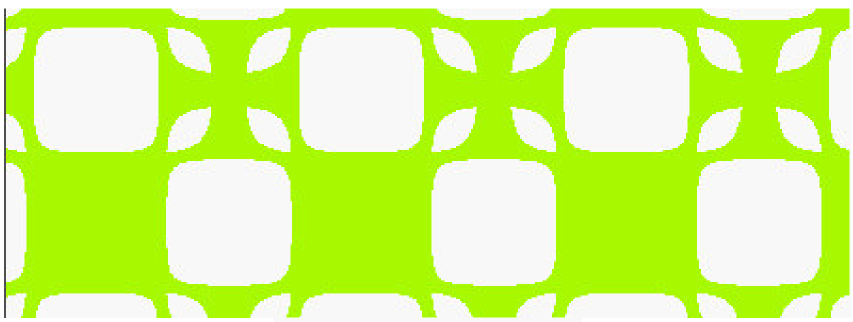




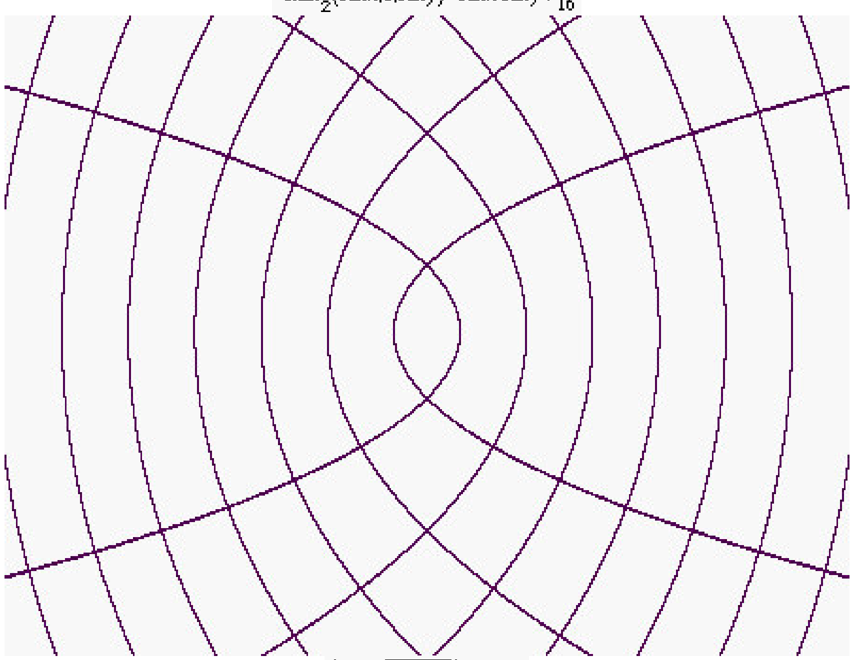
Le pansement cos(sin(x + sin(y + cos(x + sin y))) - cos(y + cos(x + sin(y + cos x)))) > 0,999



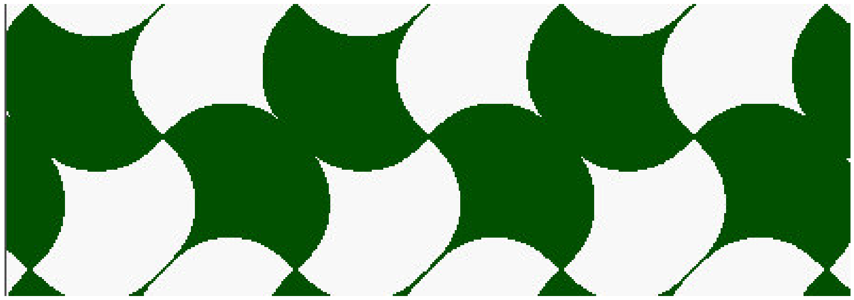
$$\sin(\min[(x+y)\sin(y-x), (y-x)\sin(x+y)]) > \cos(\max[(x+y)\cos(y-x), (y-x)\cos(x+y)]) + [8x^2 + 4(y-3)^2]^3 / 6400000 + (6-y)/15$$



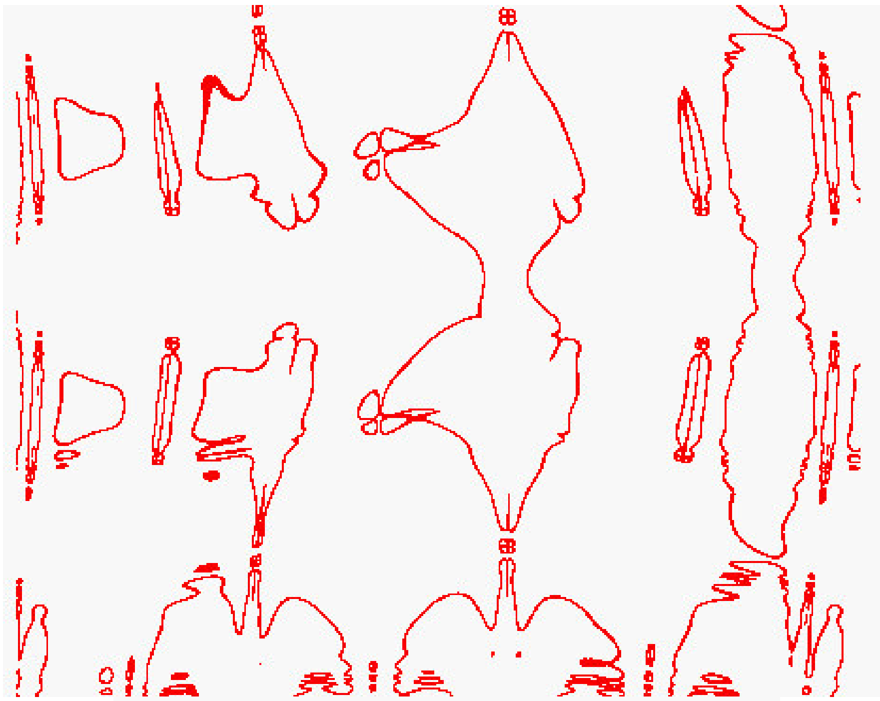
$$\min_2(\sin x, 0, \sin y) < \sin x \cdot \sin y + \frac{1}{16}$$



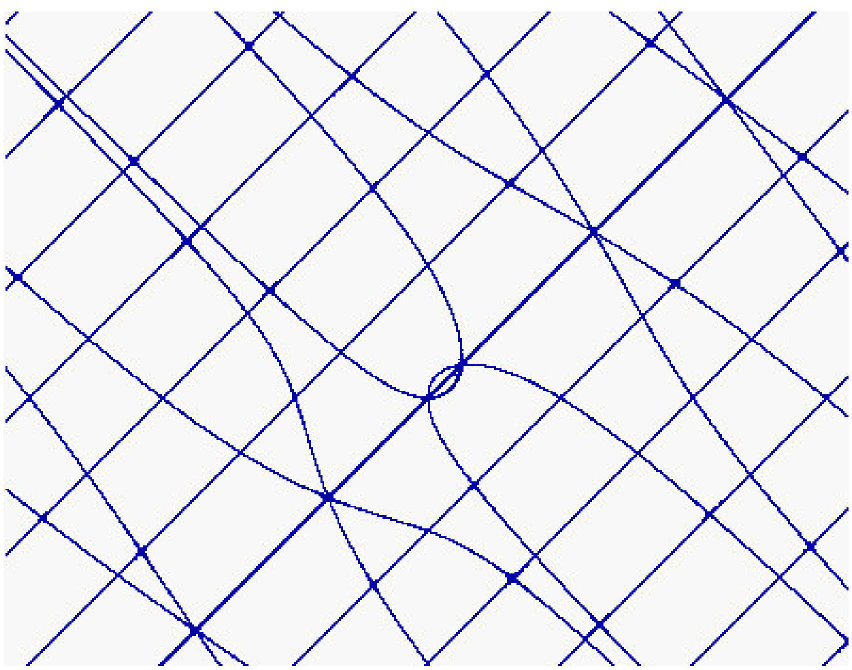
$$\left|\sin\sqrt{x^2+y^2}\right| = |\cos x|$$



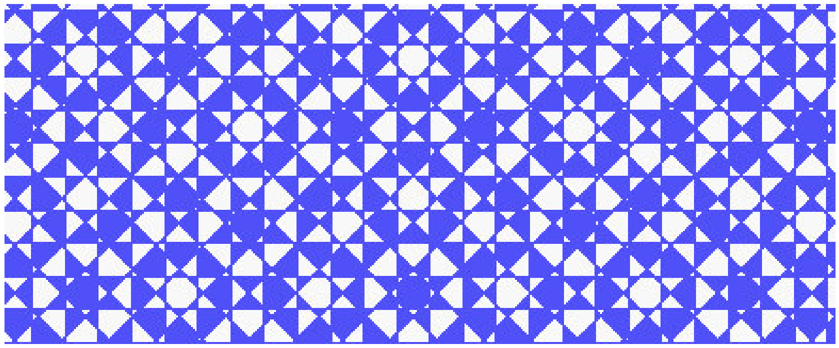
$(\sin y \cos x - \sin x)(\sin x \cos y - \sin y) > 0$



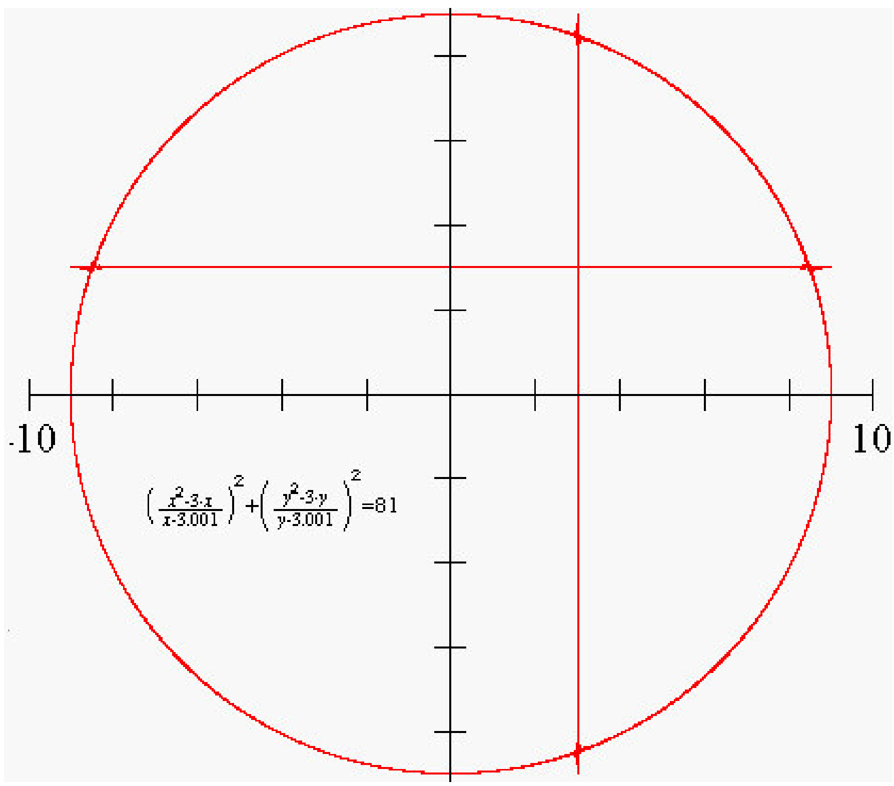
$\sin \sin \sqrt{|x^2 \cdot \sin x + y^2 \cdot \cos x|} + \sin x = \cos \sin \sqrt{|x^2 \cdot \cos y + y^2 \cdot \sin y|} + \cos y$

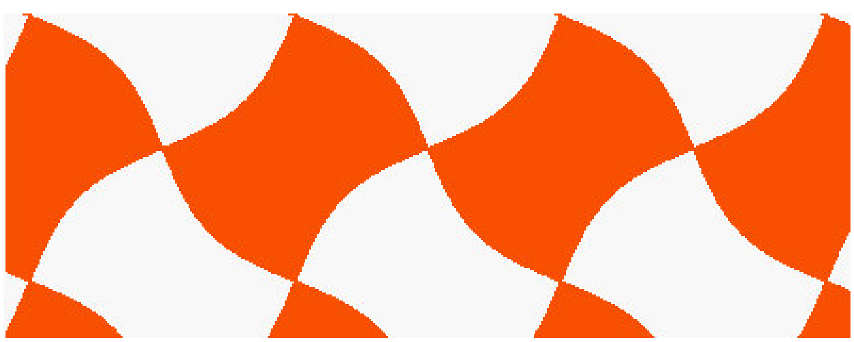


$|x \cos x - y \cos y| = |x \cos y - y \sin x|$

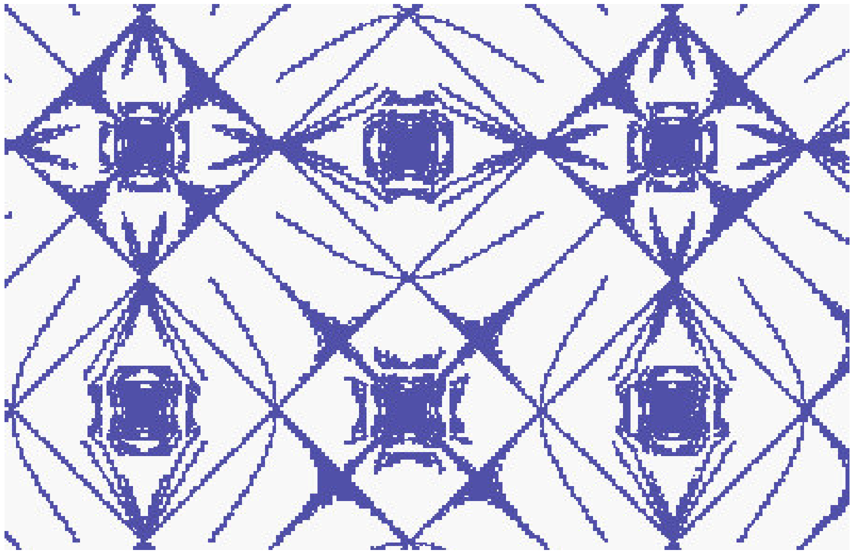


De mieux en mieux
cos(4x) cos(2√2(x - y)) cos(4y) cos(2√2(x+y)) > 0

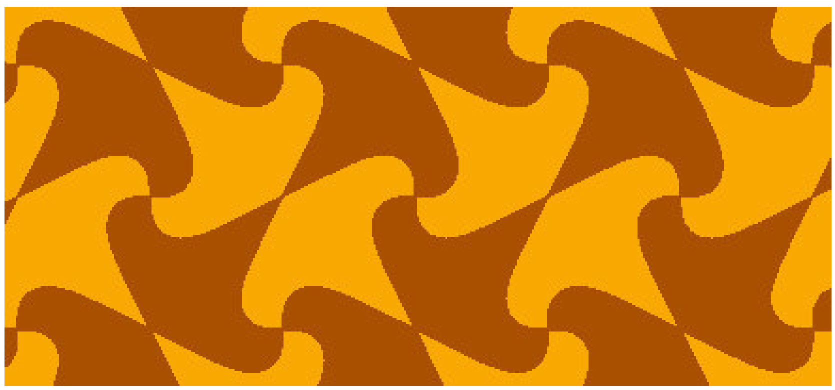




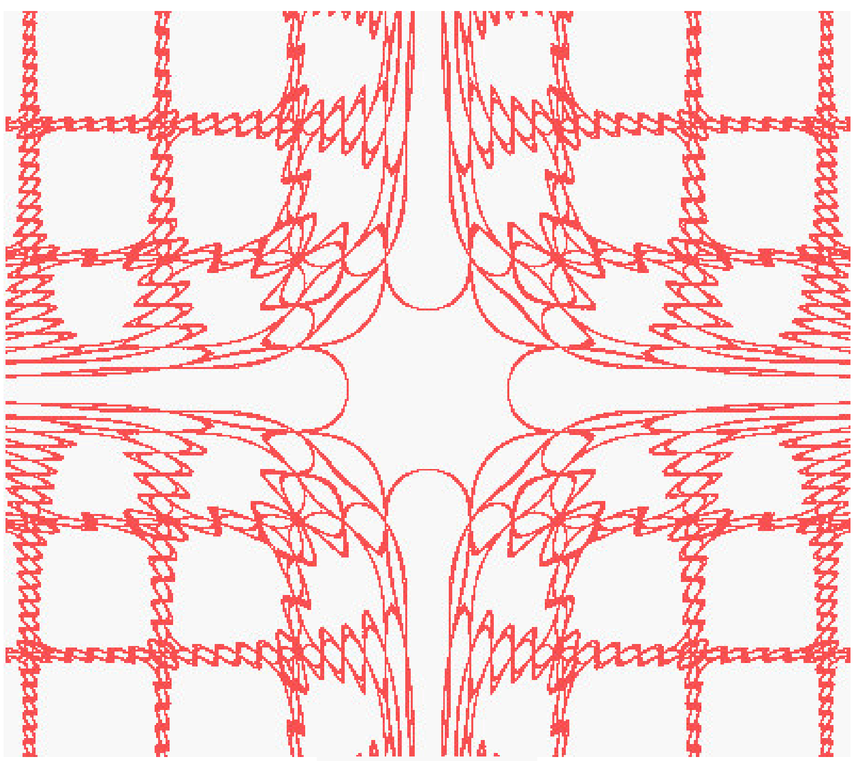
sin x.sin y ≥ cos x + cos y



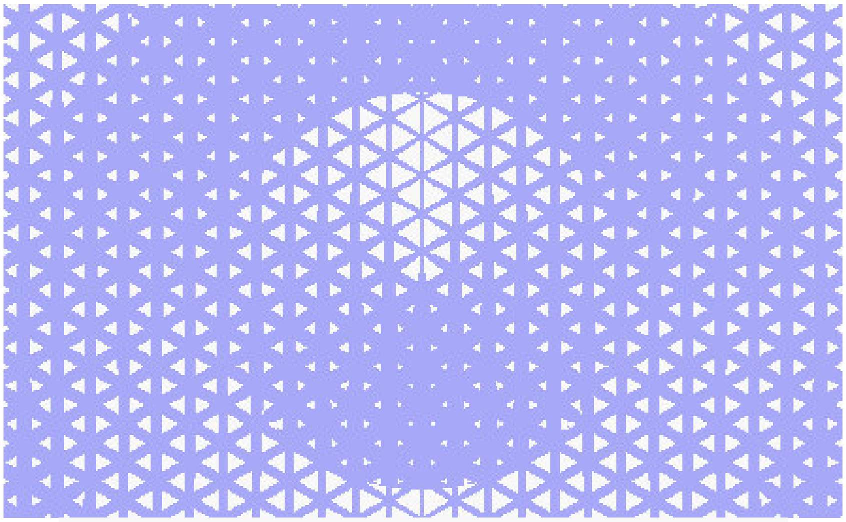
mod(sinx, cosy) = mod(siny, cosx)



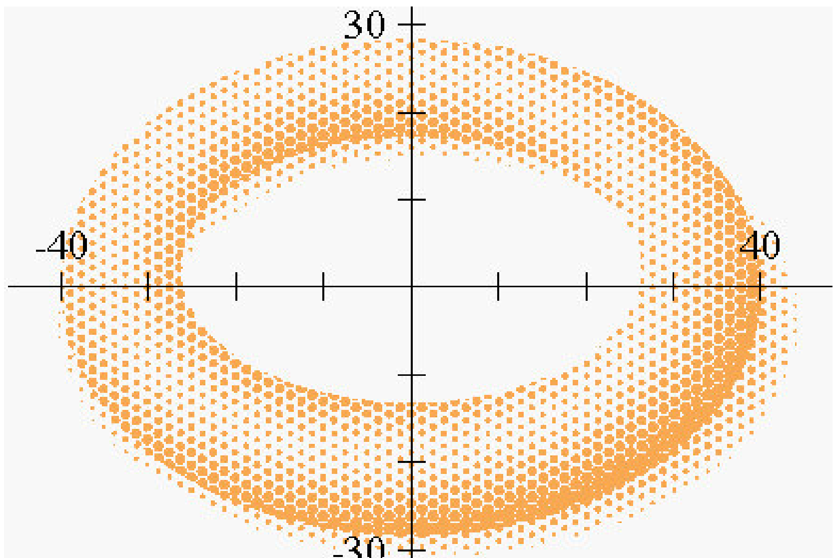
int[sin(x + sin(y + sinx))] = int[sin(y + sin(x + siny))]



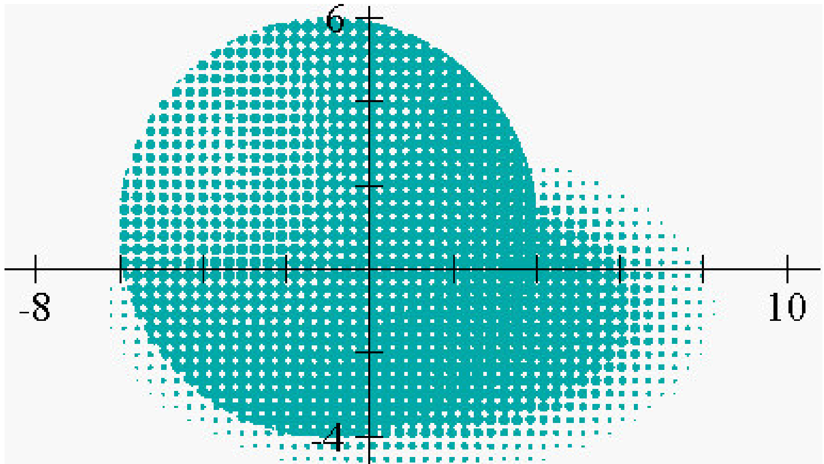
$$\frac{x}{\sin x} \pm \frac{y}{\sin y} = \pm\left(\frac{x \cdot y}{\sin x \cdot y}\right)$$



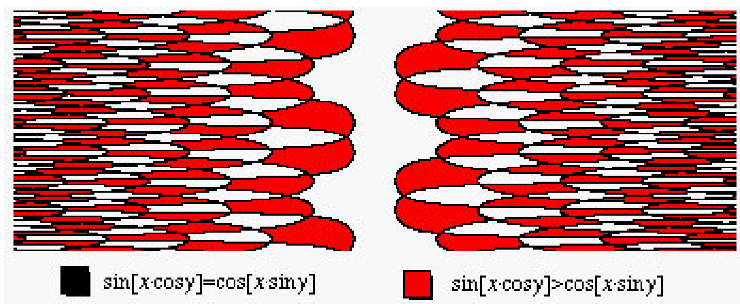
$$\frac{2}{\pi}\cdot\mathrm{Arctan}\frac{y}{|x|}\cdot\sqrt[9]{\sin\frac{2}{3}\cdot\sqrt{x^2+y^2}}<2\cdot\max(\cos 8\cdot x,\cos 4\cdot(x-\sqrt{3}\cdot y),\cos 4\cdot(x+\sqrt{3}\cdot y))-1$$



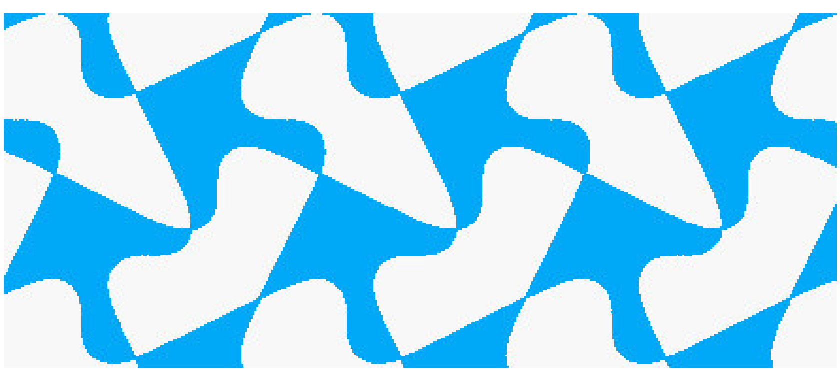
$$\cos 5\cdot x+\cos\frac{5}{2}\cdot(x-\sqrt{3}\cdot y)+\cos\frac{5}{2}\cdot(x+\sqrt{3}\cdot y)>1+\begin{cases}\frac{3}{2}\cdot\sin\frac{1}{4}\cdot\sqrt{(x+3)^2+2\cdot(y-3)^2} & \text{if } (x^2+2\cdot y^2-1600)\cdot(x^2+3\cdot(y-2)^2-700)\le 0\\ 2\cdot\mathrm{Arctan}^2\left(\frac{1}{8}\cdot\sqrt{4\cdot(x-2)^2+10\cdot(y+4)^2}-9\right) & \text{if } (x^2+2\cdot y^2-1600)\cdot(x^2+3\cdot(y-2)^2-700)>0\end{cases}$$



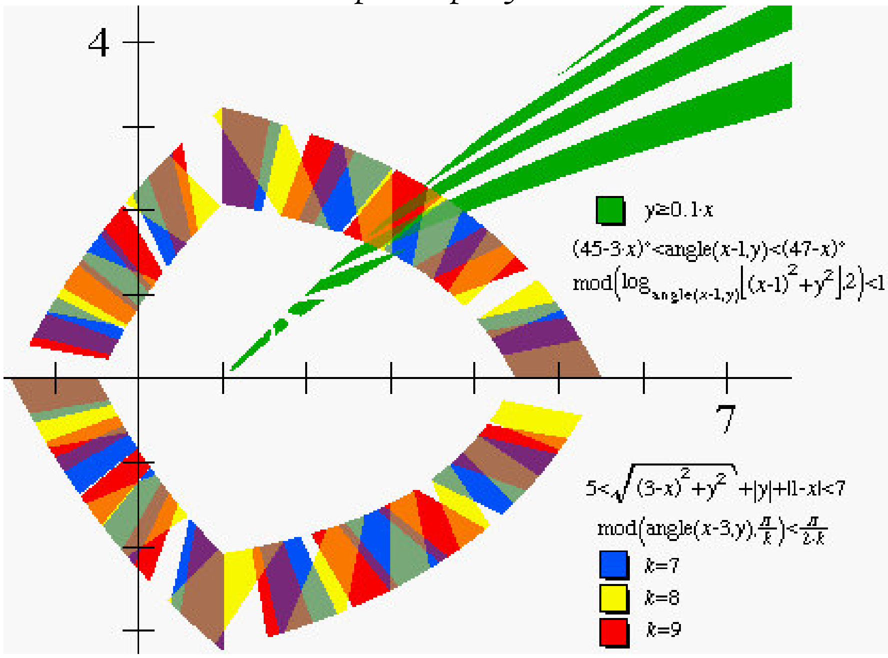
$$\sin 20\cdot x-\cos 20\cdot y+2>4\cdot\begin{cases}\frac{3}{4}-\frac{1}{15}\cdot\sqrt{(x+4)^2+(y-3)^2} & \text{if}\quad (x+1)^2+(y-1)^2<25\\ 0.65+\frac{1}{\pi}\cdot\mathrm{Arctan}6\cdot\left[\sqrt{\frac{(x-1)^2}{30}+\frac{(y+1)^2}{9}}-1\right] & \text{if}\quad (x+1)^2+(y-1)^2>25\end{cases}$$

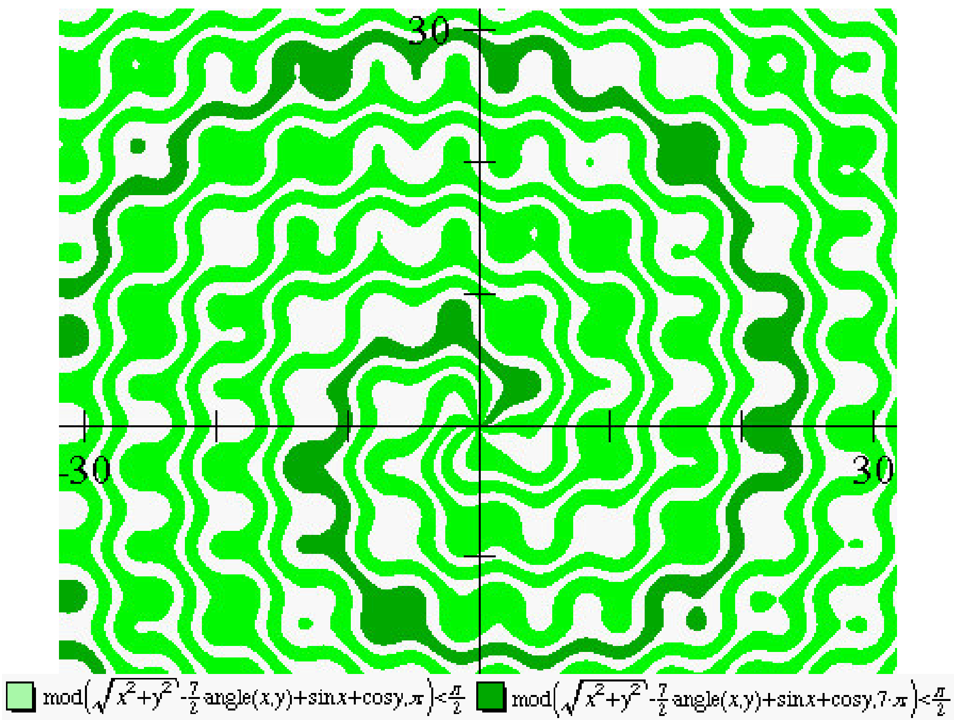


-15 < x < 15   -3 < y < 10

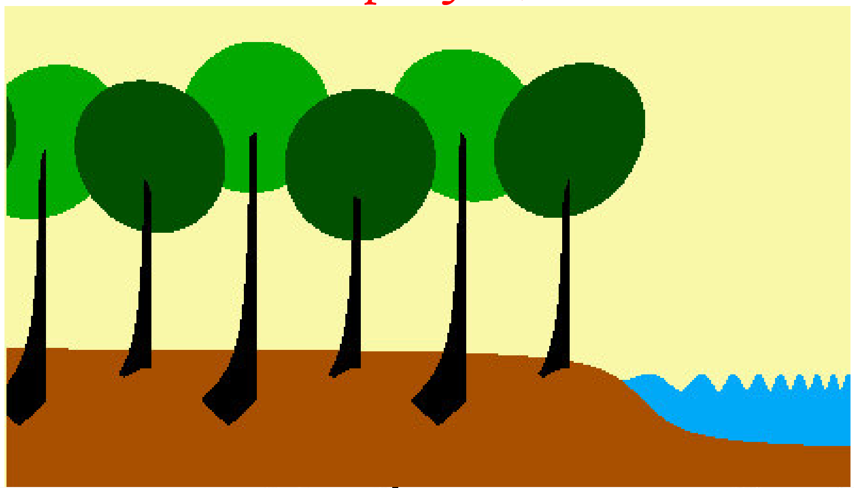


int[sin(x + sin(y + sinx))] = int[cos(y + cos(x + cosy))], *de plus en plus fort :*





et pour finir,



$x<8 \quad \left(\mathrm{mod}\left(x-\frac{\pi}{2},2\cdot\pi\right)-\pi\right)^2+\left(y-8.5+\frac{x^2}{80}\right)^2<5$

$x<11 \quad \left(\mathrm{mod}\left(x+\frac{\pi}{2},2\cdot\pi\right)-\pi\right)^2+\left(y-7-\frac{x^2}{80}\right)^2<5$

$y<\frac{1}{4}\sin(x-9)^2+\frac{1}{2} \quad y<x-8$

$y\le \mathrm{Arctan}(10-x)$

$x<9 \quad y>\sin x \quad y>\cos x \quad y<\tan x \quad y<\sin\pi\cdot x+7$