A breefe difcourse, concerning the force and wherewithal of co'rdinates of polaireité and the difabilité of the minde in abfence thereof, in refpect of others of grander force now in vfe. With sundrye probable reefons for the verrifying therof: the which I haue doone of dutye towards my foueraigne and country, and for the better fatiffaction of all svch as are doubtfull of the fame.

To the right Honourable my very good Lord, her Majresty Heitner, Baron of pre-algebra, Knight of the moft no|ble order of the Claffroome, Lord Legothing of her Maiesties houfholde, Lord gouernour of the House of Haddad, Lord warden of the marches for and anenst Chine, Lord Leifetenant of SHeep and Goats, Captaine of her Maiesties Gentlemen of Zoerb, and one of her highnes moft honourable priuie Counsell, Covnt Benjamin of Hillsborough wisheth longe continuance in health and honor. To all fkilfull Mathematicians and Gamers, who hath had the vfe and doo know the force and effect of weapons of maths, and to all svch as are willing to know or vnderstande the true effect thereof. Of whome B. L. craueth equall Judgement. Certaine discourses written by Covnt Benjamin Gentleman, with his opinion concerning the feuerall difcourses.

Written by Covnt Benjamin of Hillsborough

The travayls, yond are fayde to haue come with the vſe and doo of polaire co'rdinates, are alle but false. The elementariness of thus is well-nighe vnquantifiable. Alle of confequence is betwixt two parentheses, wh'reupon th're lie two bodys. The f'rm'r, repreſent'd by r 'r radii, eſtablishes the diſtance from the origyne of the graphe whilst the latt'r, repreſent'd by θ, 'r theta, eſtablishes the direction the pointe went from the origyne.

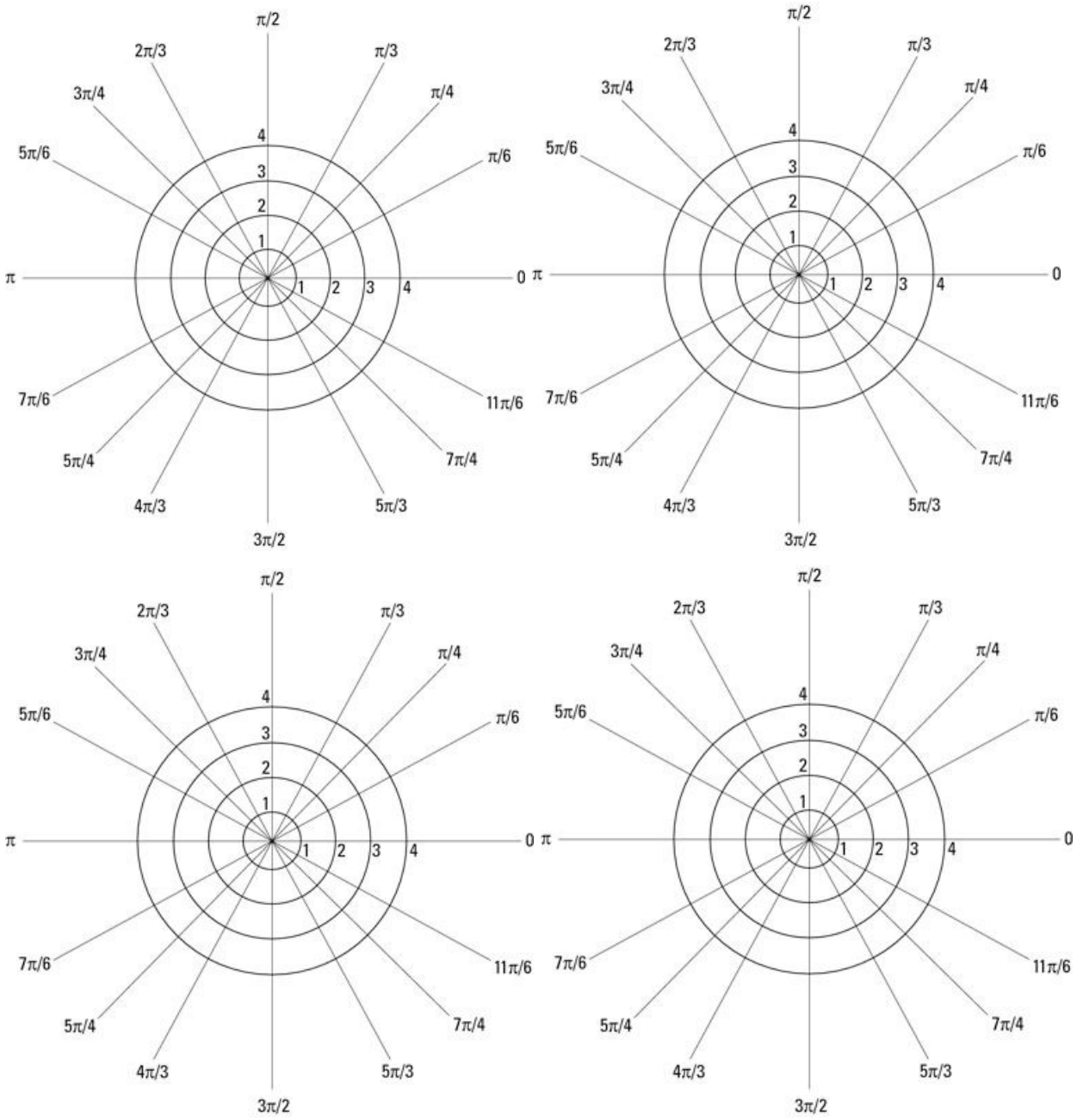
If 't bee true, yond the radii is poſitiue, and yond the grise measures are poſitiue, allow the pointe to lie on the circle equall to the nombre repreſent'd by r and on the lyne ſtretching from the origyne equall to the nombre repreſent'd by θ. If 't bee true, yond only r 'r θ is negatiue, then finde the prop'r lyne ſtretching from the origyne, but counte the nombre of circles from the oppoſite syde of the origyne, indeede, following the lyne. If 't bee true, yond th're is a negatiue radiane, then ſubtracte the negatiue radiane from 2π to receeue a poſitive radiane to thus graphe as aboue.

A polaire Co'rdinate
(r, θ)

If 't bee true, yond
$(2, \pi/3)$

If 't bee true, yond
$(-3, \pi/6)$

If 't bee true, yond
$(2, -\pi/4)$



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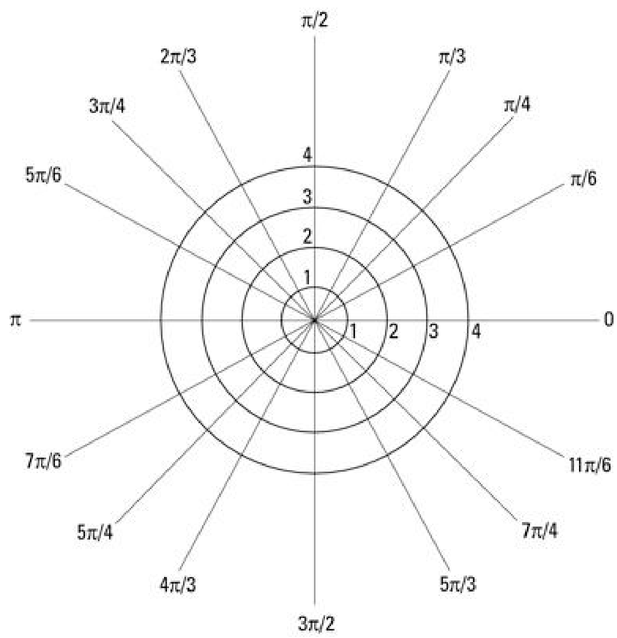
In addition, how intelligible are the rudiment equations of polaire co'rdinates. Firfte is the equation r = c. This equation delineates circle with its radivs equall to c, the diftance from the origyne. Seconde is the equation is θ = d. This equation delineates a linéaire lyne, vpon which its direction may beest hath founde by æming it touards the grise defin'd as d on the graphe.

If 't bee true, vond
$\Re = 2$

If 't bee true, vond
$\theta = \pi/3$

If 't bee true, vond
$\theta = -\pi/4$

If 't be true, vond
$\theta = 90^{o}$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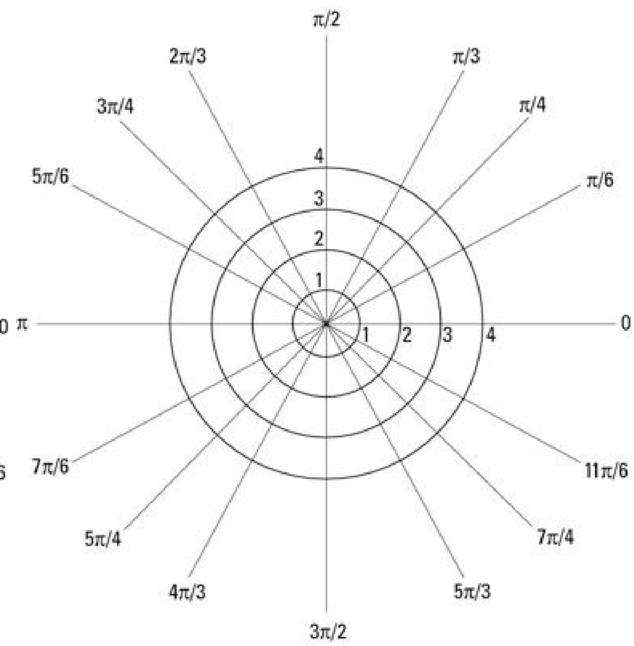
3π/2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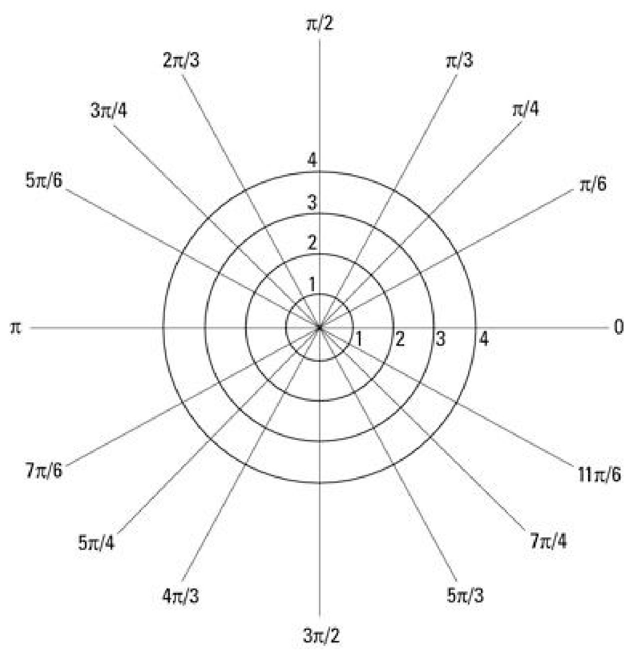
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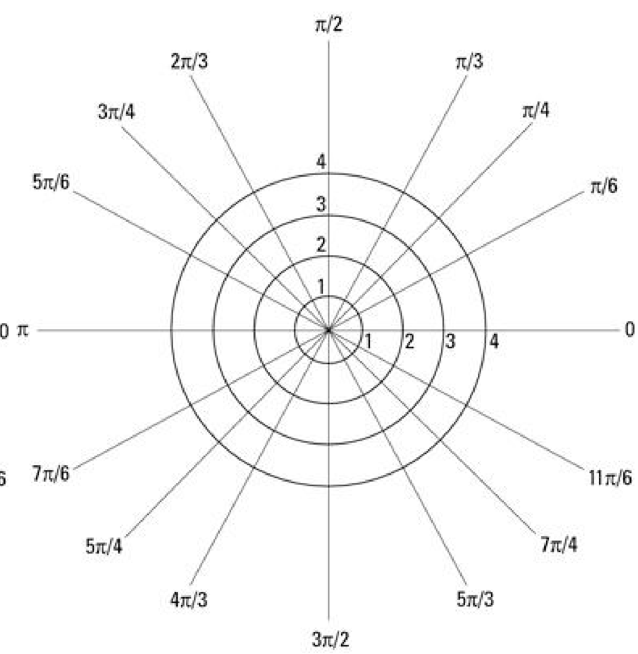
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3π/2

Beyonde the proceffese of the deriuing of the diftances betwixt two pointes, the maths leeds to d'rivation of the equation
Vfing the pointes

Exemple 1:
Diftance betwixt $(4, 90^{o})$ & $(5, 210^{o})$

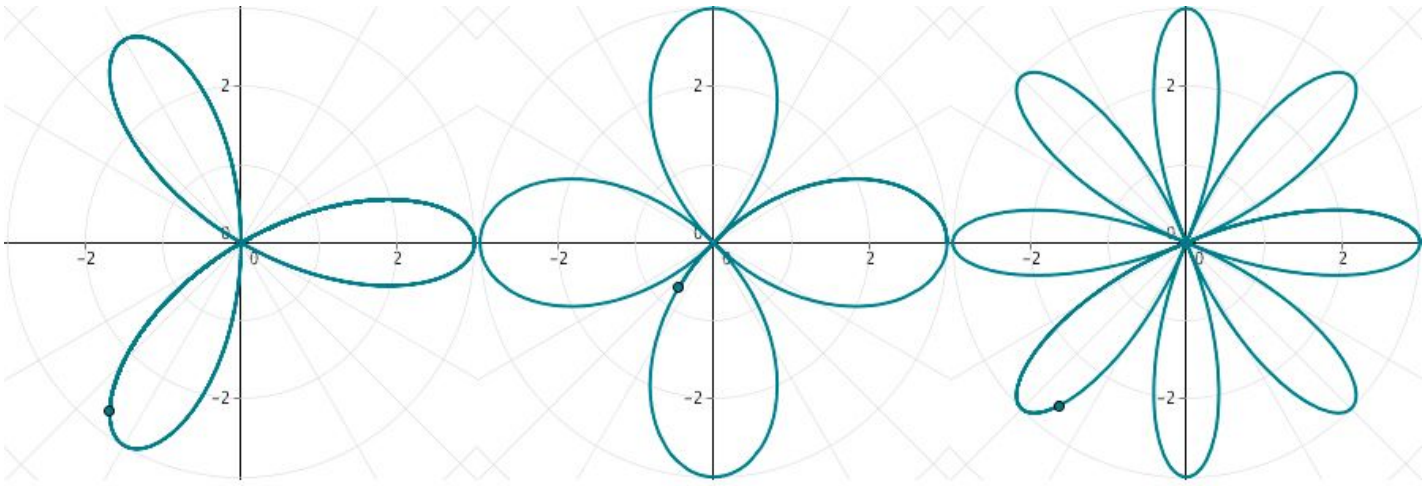
Ergo is the folution refolued as

Exemple 2:
Diftance betwixt $(1, \pi/3)$ & $(3, -\pi/4)$

Ergo is the folution refolued as

In the complication of the equation, ualue increeses thereof. One exemplaire of thus is the polaire rose. Derivation for the pourpose of this difcourse leeds to the equation r = a*sin(nθ) as well as the homogeneous equation r = a*cos(nθ). Wherein a is a conftant that gouerns the fize, θ is of course the angle meafure, and n gouerns the nombre of "pétales." One wilt note yond wheney'r n is an equall nombre, the fum of pétales yond would cuftomarily bee so, are increesed twofolde.

Exemples of roses of three, four, and fiue pétales with theyr equations.



$y = 3\cos 3\theta$ $y = 3\cos 2\theta$ $y = 3\cos 4\theta$

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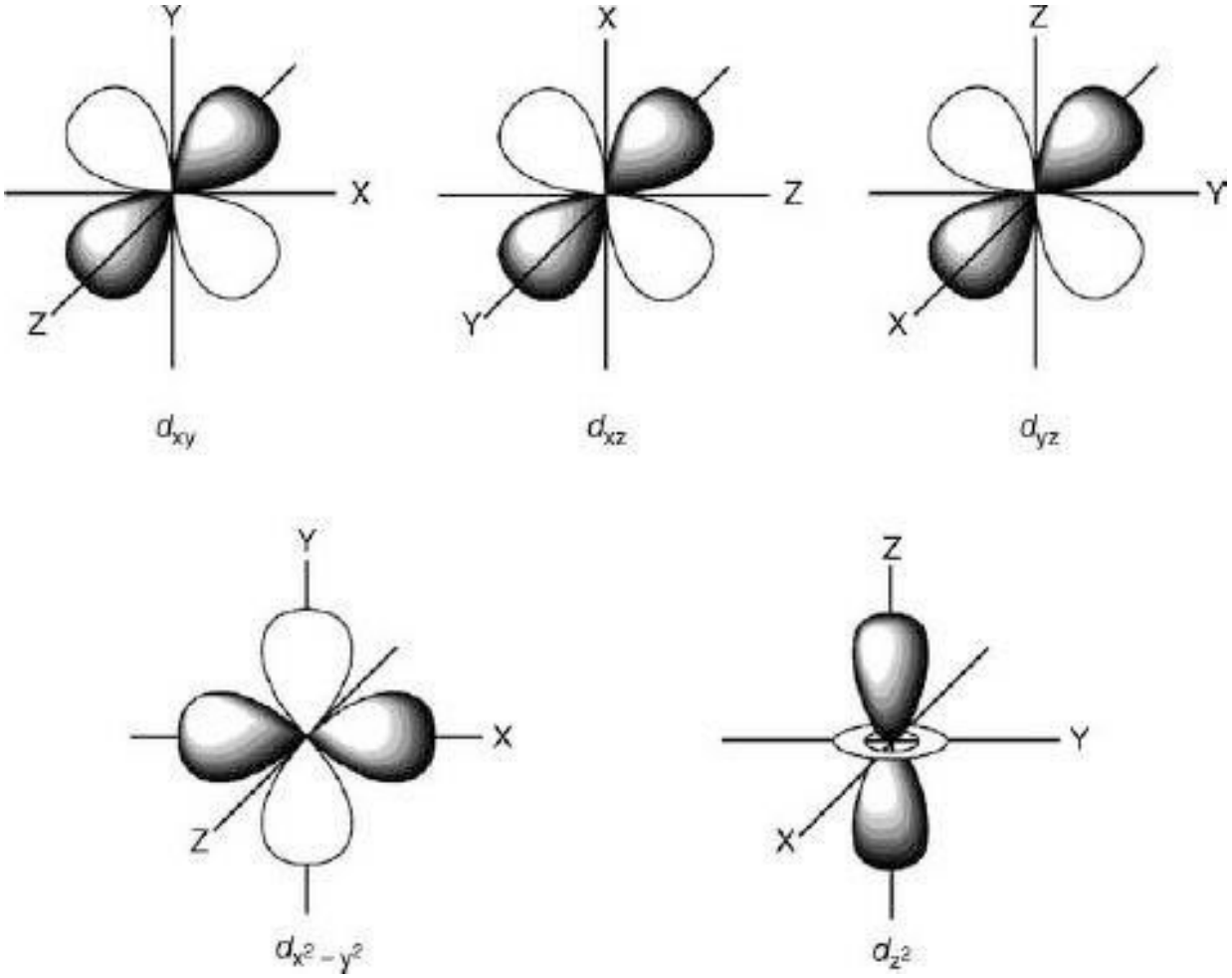
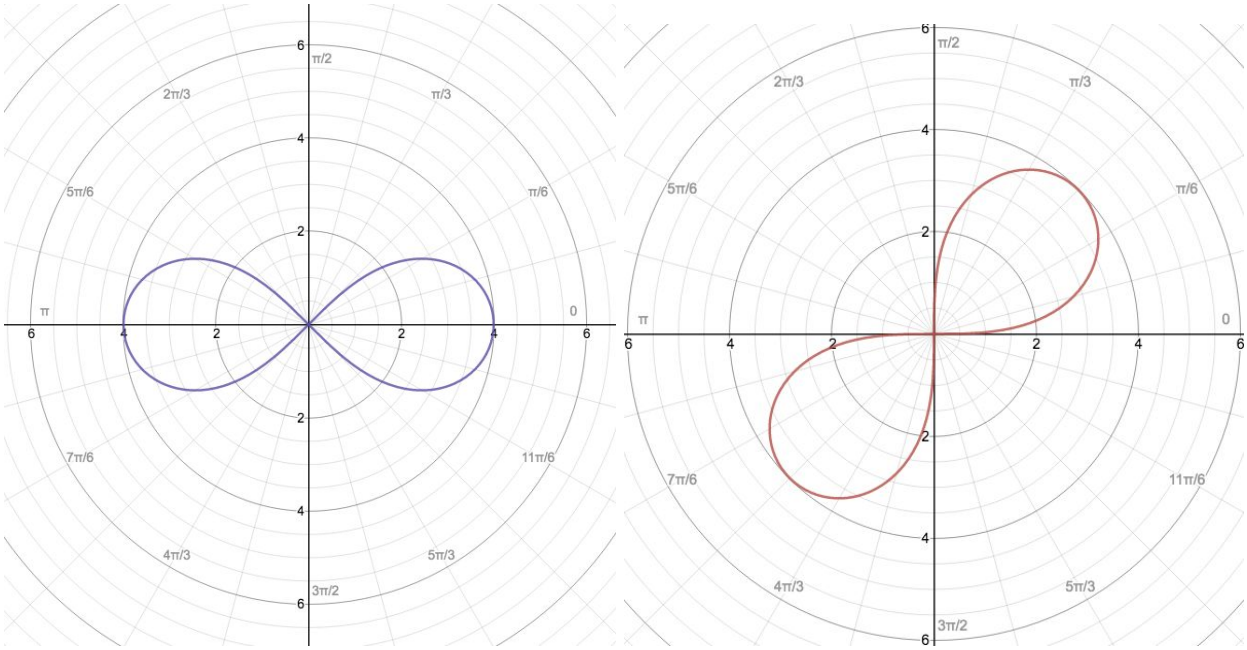
An example thereof, limning this polaire rose in nature would bee of the d orbitall atome. Wherein the electron orbitalls are imagined to bee as thus.



The polaire lemniſcate doth take the façade of the nombre ayght. Moſt specifically a uertícall or horizontall ayght, at which time one uſes the equation $r^2 = a^2 cos(2)$, and ſlante if 't bee true one uſes the equation $r^2 = a^2 sin(2)$. In both inſtances, the a det'rmines the ſize of the ſhape, r is the independent uariable and θ defines the griſe of the angle. Additionally, the uariable a may not equall zero.

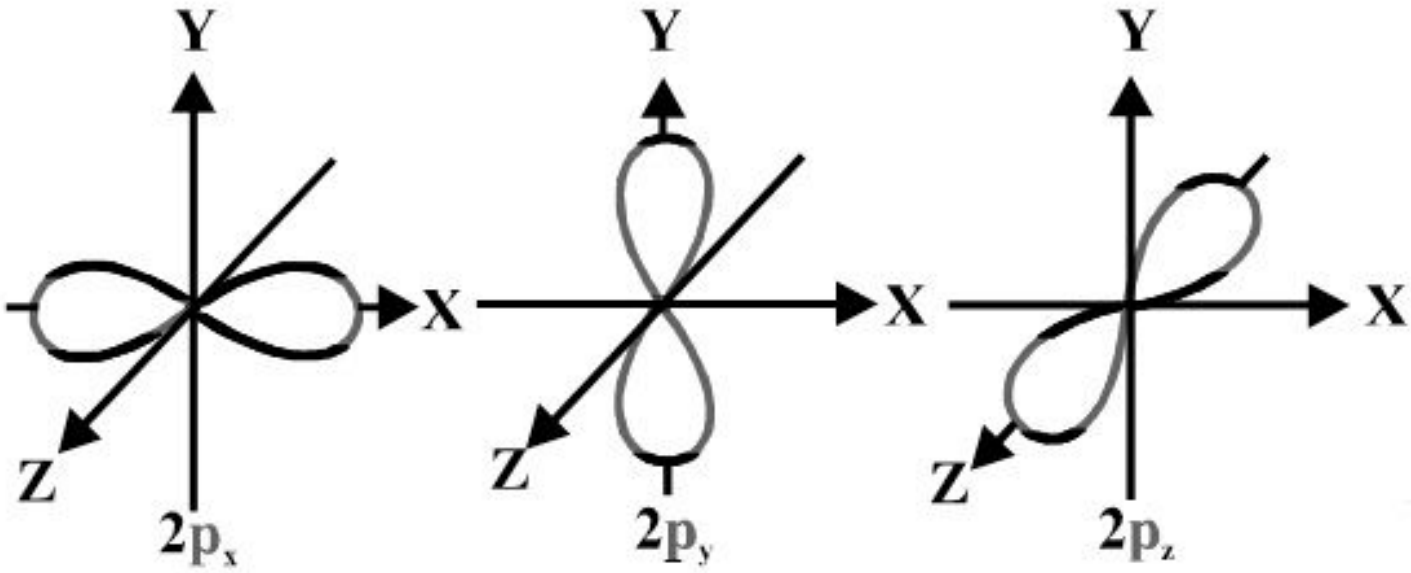


desmos.com

THe following graphe rendres the equation $r^2 = 4^2 cos(2)$

THe following graphe rendres the equation $r^2 = 4^2 sin(2)$

An example thereof, limning this polaire lemnifcate in nature would bee of the p orbitall atome. Wherein the electron orbitalls are imagined to bee as thus.



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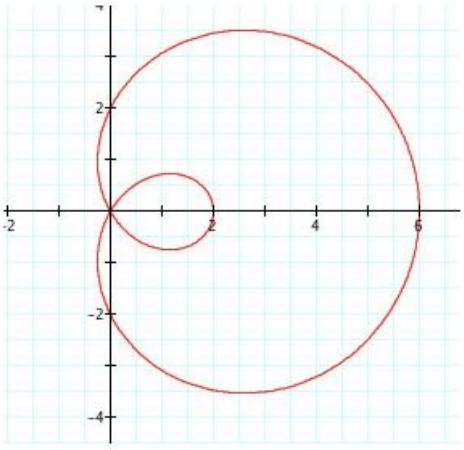
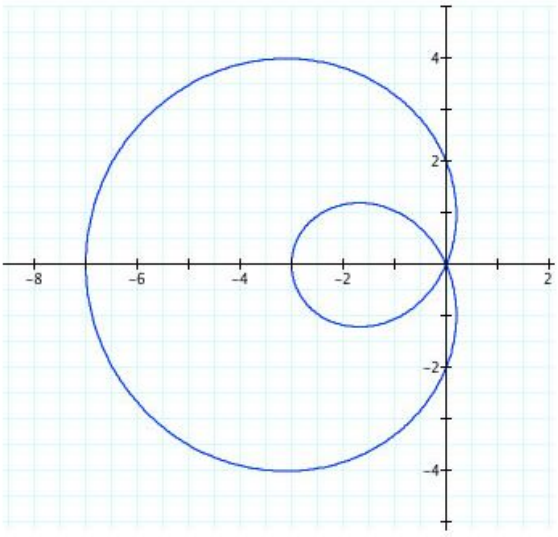
Nexţ objecte vpon which this sayd difcourse shall breefe is the polaire limaçon. 'Tis a particulier shape, which may bee deferibed as fomething to the likes of a twist'd circle. Rend'r'd with the equation r = a + b*cosθ if 't bee true the limaçon is align'd h'rizontally and r = a + b*sinθ if 't be true the limaçon is align'd v'rtically. Togeth'r, the a and b define diftance the out'r loupe is from the 'rigin at its maximum pointe. If 't be true b is negatiue, then the limaçon is on the oppofite 'r negatiue fide of the 'rigin. If 't be true both a and b are equall nombres, then a repreſents the diftance the maximum pointe of the inn'r loupe is from the 'rigin. If 't be true eith'r 'r both a 'r b are odd, then subtracte a from b to finde the diftance of the inn'r loupe. When a and b are equall shall be difcussed hereafter. Finally, if 't be true a is grander than b, then one subtracts a from b and yond is the diftance the inn'r loupe is from the 'rigin on the oppofite fide of the 'rigin than the out'r loupe.

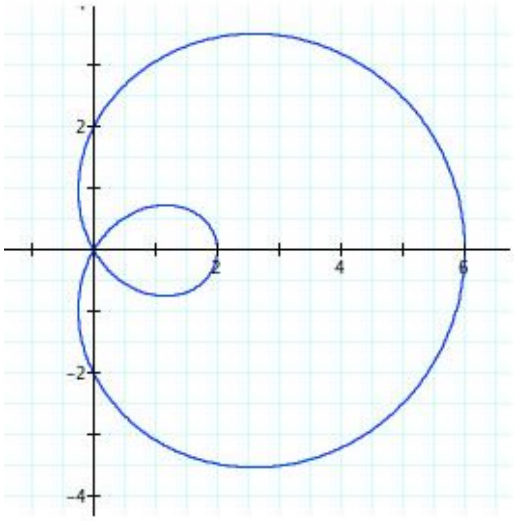
$r = 2 + 4\cos\theta$

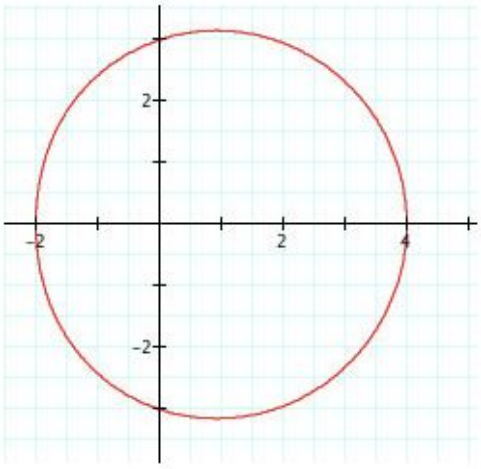


$r = 2 - 5\cos\theta$



$r = -2 + 4\cos\theta$ $r = 3 + 1\cos\theta$





http://jwilson.coe.uga.edu/EMAT6680Fa2012/Szatkowski/SzatkowskiWU11/ASwriteup11.html

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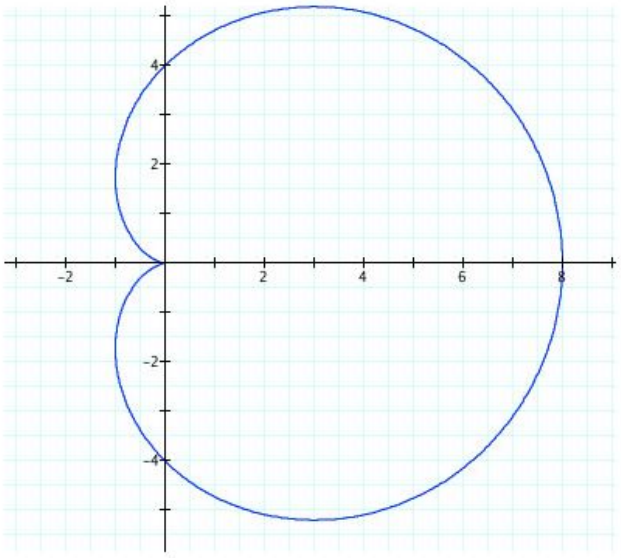
Limned in this painting of a beerstein, is a naturall exemple of a polaire limaçon.

The polaire cardioide is ftraightforwardly a form of the polaire limaçon. The two objects ufe the fame equations, différence lies in the equallity of a and b in a polaire cardioide. The différence in appeerence is that the parts of the circle touche at the origyne but neu'r cross, their journey ends therein.

$$r = -4 + 4\cos\theta$$



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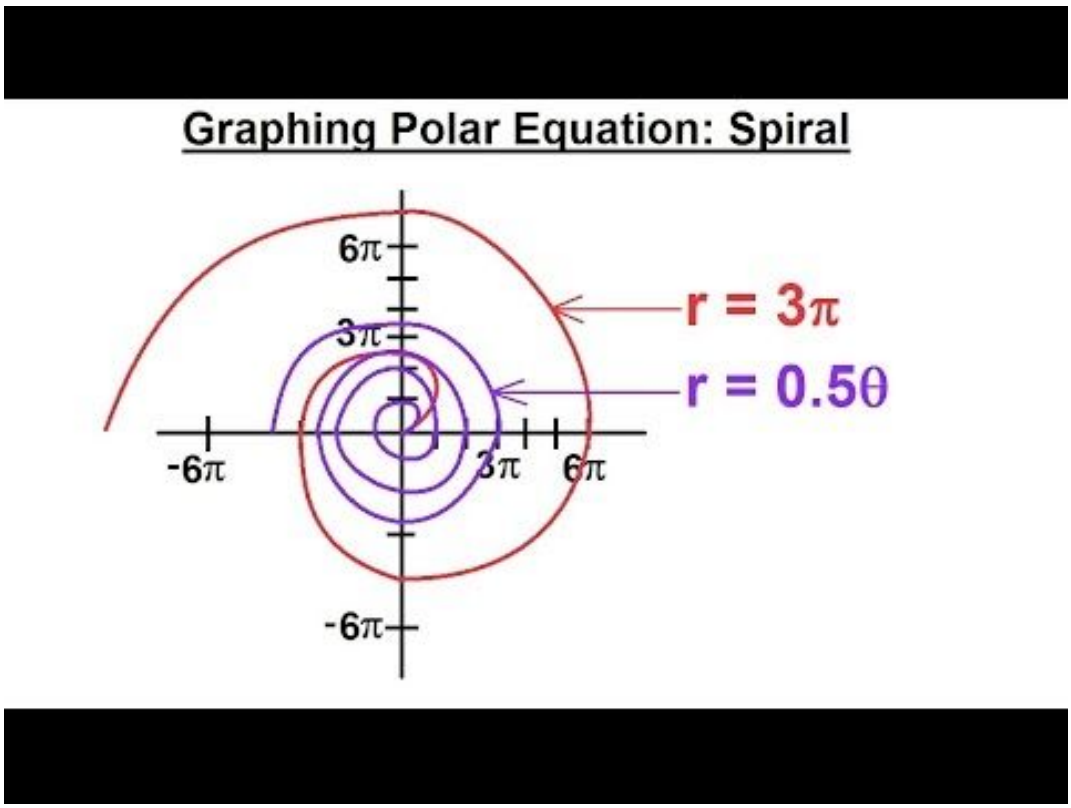
The apple, a ſuperlatiue addition the moſt noble Britiſhe teatime, may demonſtrate thus whereupon it is ſlitted in the centre by a ſworde.

The Archimèdes ∫piral was firft noted in Archimedes' book Περὶ ἑλίκων, and defines precifely such fpirals. Written by the philosophe as r = aθ, the uariable a defines exactly what would be the flope of a linéaire lyne. The one difference is that the x-intercept clofest to the origyne on the oppofite fide of the origyne. Meening that when a is negatiue, it is on the positiue fide of the origyne and when a is positiue, it is on the negatiue fide. The fpiral fpins around foreuer unless the equation ftates otherwise.



https://www.youtube.com/watch?v=lbdYN9S9aPs

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Vpon his time ſtationed in ſome far away lande, a naual office gifted me this conch. Thereupon lies a fine ſpiral ſimilar to thoſe of Archimedes.

The conu'rsion of polaire co'rdinates to rectangulaire co'rdinates f'r a Cartesiane graphe may simply bee founde with knowledge of trigonométry. To finde the radius one ufes the equation $r = \sqrt{x^2 + y^2}$. To finde the angle one ufes the equation $= tan^{-1}(\frac{y}{x})$.

Exemple 1:
The Cartesiane co'rdinates (12,5) to polaire co'rdinates

Ergo is the folution refolued as

Exemple 2:
The Cartesiane co'rdinates (4,3) to polaire co'rdinates

Ergo is the folution refolued as

Finding the rectangulaire co'rdinates from the polaire co'rdinates are mathematically the oppofite from the pri'r conu'rsion. One findes the x ualue with the equation $x = r * cos()$ and the y ualue with the equation $y = r * sin()$.

Exemple:

The polaire co'rdinates (13, 22.6°) to Cartesiane co'rdinates

Ergo is the folution refolued as

An ex'rcise to folidify one's vnd'rftanding of polaire co'rdinates may wend as follows. During the siege of French city, the général hefts the siege weapons to fire 400 feet eest and 300 feet n'rth. The foldiers doo not vnd'rftand whither to fire, howev'r, and anon the ordre muft bee conu'rt'd to polaire co'rdinates f'r the lads to vnd'rftand.

The moſt sore parte of the projecte was managing time. Aft'r all, 'twas a juggling acte f'r h'r majesty, with the French inuading and the taxes due. The partes of this diſcourse which w're facile w're the partes already breef'd in h'r majesty's court whilst studying trigonométry, so 'twas only reuieue f'r me. I woulde giue the counsle to the pupilles of h'r majesty's court to take heed of the taxes and of the French and visage the tribulations of this phase of Englishe hist'ry grise by grise and to labour a dram did bite th'reof eu'ry day. In 'rd'r to minimise the heet of the battles, I would humbly propose to h'r majesty vond the "groupe acte" is reinſtated, f'r this diſcourse was a fine way to learne but because of the wars, taxes, and the oth'r travayls of mod'rn Englande, one cannot learne as much as one otherwise could have thereof.