

$$\tan \theta = \frac{y}{x}$$

Rect.

$$r = \sqrt{x^2 + y^2}$$

Polar (r, θ)

$$\text{Ex: } (-3, -\sqrt{3})$$

\Rightarrow

$$(2\sqrt{3}, \frac{7\pi}{6})$$

$$x = r \cos \theta$$

$$y = r \sin \theta \quad (2\sqrt{3}, -\frac{5\pi}{6})$$

$$\text{Ex: } (-4, \frac{5\pi}{3})$$

$$(-4, -\frac{\pi}{3})$$

$$(4, \frac{2\pi}{3})$$

$$(4, -\frac{4\pi}{3})$$



Rect.
 $x = -4 \cos \frac{5\pi}{3}$

$$y = -4 \sin \frac{5\pi}{3}$$

$$(-2, 2\sqrt{3})$$

$$\text{vector } \langle \quad \rangle = \|v\| \langle \cos \theta, \sin \theta \rangle$$

$$a + bi = r (\cos \theta + i \sin \theta)$$

$$\text{Ex: } y = -2x + 4$$

$$r \sin \theta = -2r \cos \theta + 4$$

$$r \sin \theta + 2r \cos \theta = 4$$

$$r (\sin \theta + 2 \cos \theta) = 4$$

$$r = \frac{4}{\sin \theta + 2 \cos \theta}$$

$$\text{Ex: } x^2 + y^2 = 625 \quad r = 25$$

$$\text{Ex: } \frac{y^2}{4} - x^2 = 16 \quad y^2 - 4x^2 = 64$$

$$(r \sin \theta)^2 - 4(r \cos \theta)^2 = 64$$

$$r^2 (\sin^2 \theta - 4 \cos^2 \theta) = 64$$

$$r^2 = \frac{64}{\sin^2 \theta - 4 \cos^2 \theta}$$

$$r = \frac{\pm 8}{\sqrt{\sin^2 \theta - 4 \cos^2 \theta}}$$

$$\text{Ex: } y = \frac{5}{x} + 3 \Rightarrow \frac{3x + 5}{x}$$

$$y x = 5 + 3x$$

$$r \sin \theta \cdot r \cos \theta = 5 + 3r \cos \theta$$

$$r^2 \sin \theta \cos \theta = 5 + 3r \cos \theta$$

$$r^2 \sin \theta \cos \theta - 3r \cos \theta = 5$$

$$r = 4 \sin 2\theta$$



$$r = 6 \cos \theta$$

$$r^2 = 6r \cos \theta$$

$$x^2 + y^2 = 6x$$

$$x^2 - 6x + y^2 = 0$$

Ex! $r = \frac{5}{\sec \theta} \Rightarrow$ Rect.

$$r = 5 \cos \theta$$

$$r^2 = 5r \cos \theta$$

$$x^2 + y^2 = 5x$$

$$r = \frac{5x}{r} \Rightarrow r^2 = 5x$$

$$x^2 + y^2 = 5x$$

$$x^2 - 5x + y^2 = 0$$

$$y^2 = -x^2 + 5x$$

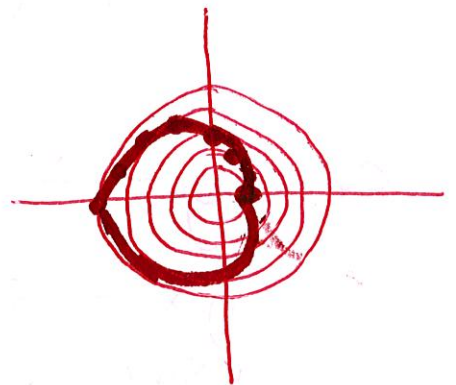
$$y = \pm \sqrt{-x^2 + 5x}$$

$$r = 3 - 2 \cos \theta$$

$$\frac{a}{b} = \frac{3}{2} \text{ dimpled limaçon}$$

$$3 - 2 \cos \theta$$

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
r	1	$3 - \sqrt{3}$	$3 - \sqrt{2}$	2	3	4	$3 + \sqrt{2}$	$3 + \sqrt{3}$	5

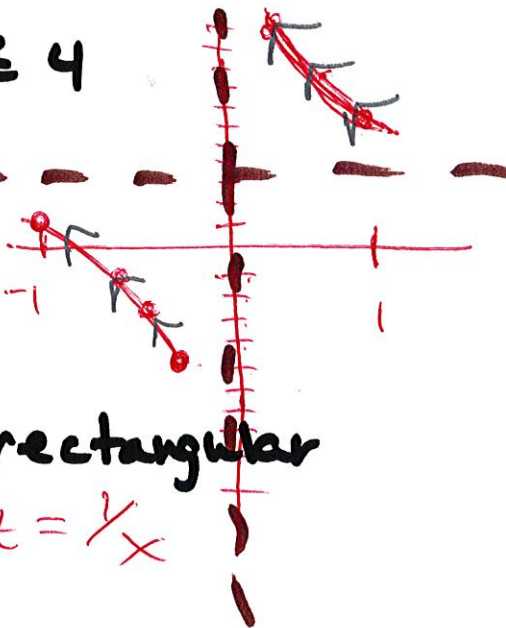


① Sketch the curve represented by the parametric equations

$$x = \frac{1}{t} \quad -4 \leq t \leq 4$$

$$y = 2t + 3$$

t	-4	-3	-2	-1	0	1	2	3	4
x	-1/4	-1/3	-1/2	-1	undef	1	1/2	1/3	1/4
y	-5	-3	-1	1	3	5	7	9	11



② Write the corresponding rectangular equation. $x = \frac{1}{t}$ $xt = 1$ $t = \frac{1}{x}$

$$y = \frac{2}{x} + 3$$

③ Write $(-6, 8)$ in polar form.

$$\tan \theta = \frac{8}{-6} = -53.1 + 180 \Rightarrow (r, \theta)$$

$$\sqrt{6^2 + 8^2}$$

$$(10, 126.9) \Rightarrow (10, -233.1)$$

④ Express $A = (-3, -3\pi/4)$ three different ways and graph.

$$(-3, 5\pi/4)$$

$$(3, \pi/4)$$

$$(3, -7\pi/4)$$

$$x = r \cos \theta$$

$$x = -3 \cos -3\pi/4$$

$$= \frac{3\sqrt{2}}{2}$$

$$y = -3 \sin -3\pi/4$$

$$= \frac{3\sqrt{2}}{2}$$



$$y = r \sin \theta$$

$$\frac{y}{r} = \sin \theta$$

$$\frac{y}{x} = \sqrt{3} \quad y = \sqrt{3}x$$

$$r = 3$$

$$r = \sqrt{x^2 + y^2}$$

$$3 = \sqrt{x^2 + y^2}$$

$$9 = x^2 + y^2$$

$$\theta = 60$$

$$\tan \theta = \tan 60$$