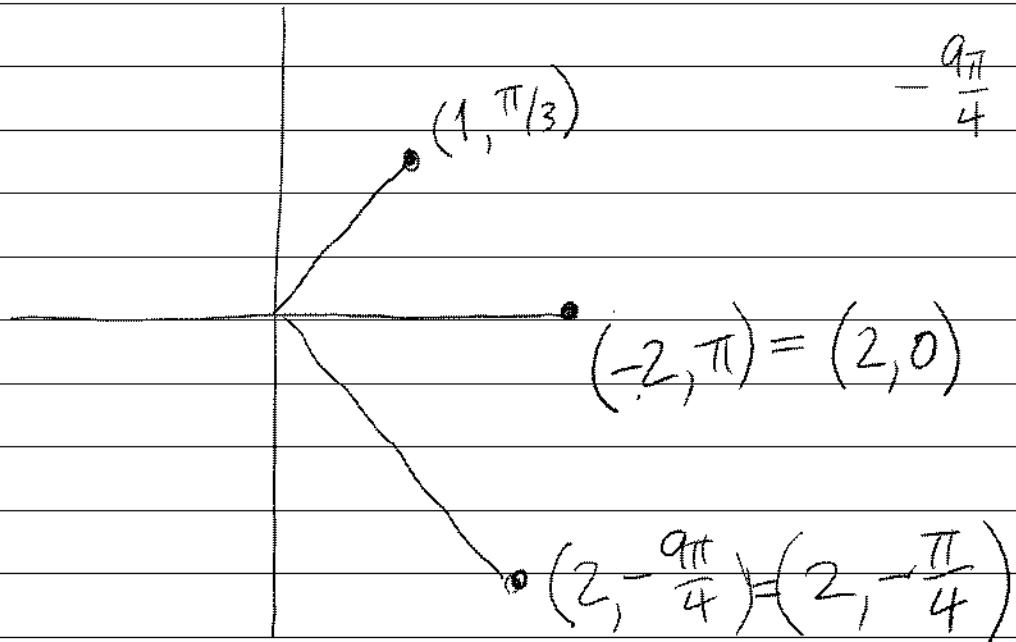
10-12

Note Title 10/12/2007

Ex Plot the polar points $(1, \frac{\pi}{3})$, $(2, -\frac{9\pi}{4})$, $(-2, \pi)$



$-\frac{9\pi}{4} = -\frac{8\pi}{4} - \frac{\pi}{4}$

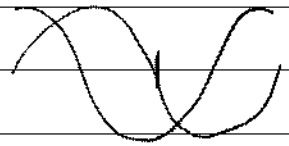
Ex Convert polar $\left(2, \frac{2\pi}{3}\right)$ and $\left(-1, \frac{\pi}{2}\right)$ to rectangular.

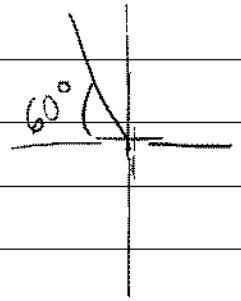
$x = 2\cos\left(\frac{2\pi}{3}\right) = 2\left(-\frac{1}{2}\right) = -1$

$y = 2\sin\left(\frac{2\pi}{3}\right) = 2\left(\frac{\sqrt{3}}{2}\right) = \sqrt{3}$

$x = (-1)\cos\left(\frac{\pi}{2}\right) = 0$

$y = (-1)\sin\left(\frac{\pi}{2}\right) = -1$





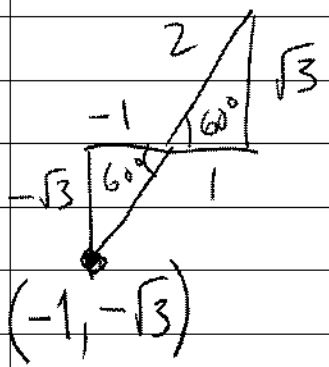
Ex Convert rectangular $(-1, -\sqrt{3})$ and $(-2, 2)$ to polar.

$r^2 = (-1)^2 + (-\sqrt{3})^2 = 4$

$\tan\theta = \frac{-\sqrt{3}}{-1} = \sqrt{3}$

Choose $r > 0$: $\boxed{r = 2}$

$\tan\theta = \sqrt{3}$ if $\sin\theta = \frac{\sqrt{3}}{2}$, $\cos\theta = \frac{1}{2}$



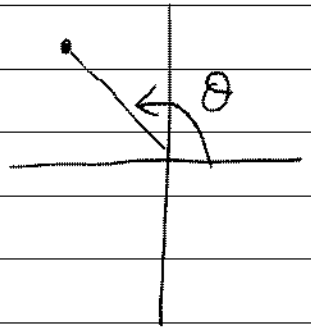
$\theta = \frac{\pi}{3}$

OR

$\boxed{\theta = \frac{4\pi}{3}}$ gets right point for $r > 0$

$r^2 = (-2)^2 + (2)^2 = 8$

$\tan\theta = \frac{2}{-2} = -1$

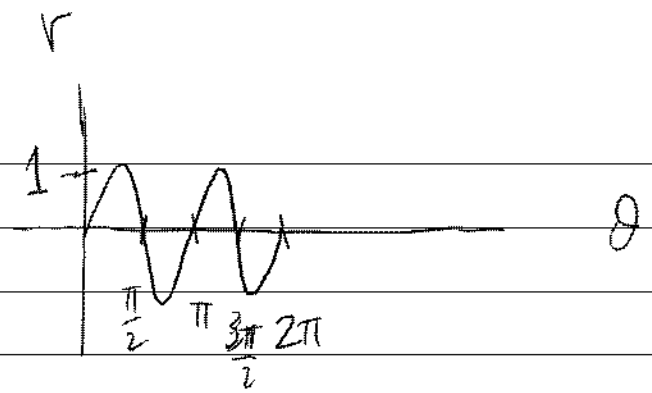


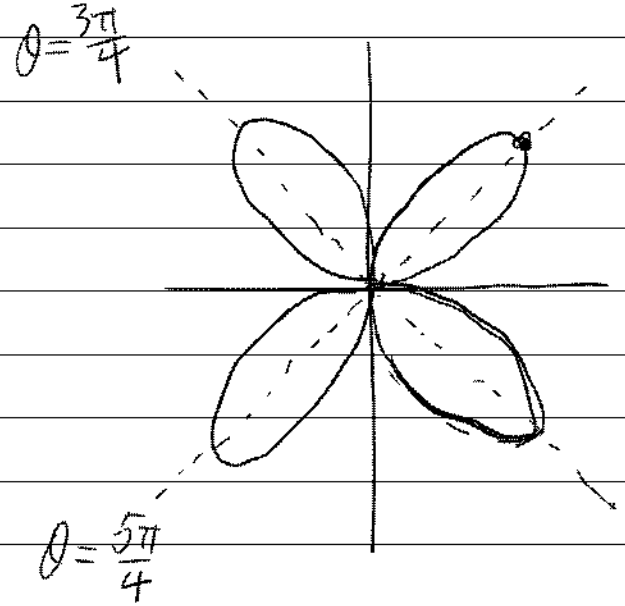
$r = \sqrt{8} = 2\sqrt{2}$

$\theta = \frac{\pi}{2} + \frac{\pi}{4} = \frac{3\pi}{4}$

Ex Sketch $r = \sin 2\theta$

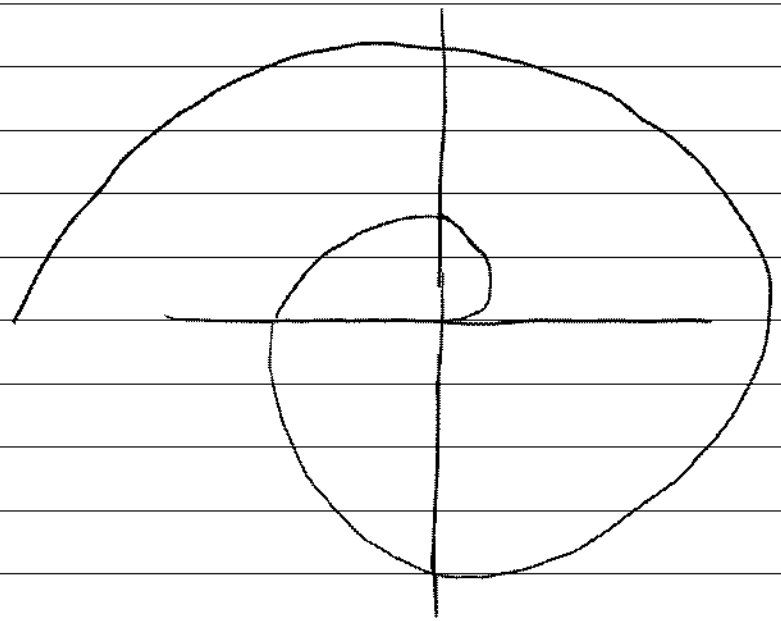
(Non-polar interpretation)





"rose"

Ex $r = \theta, \quad 0 \le \theta \le 3\pi$



Spiral

Ex Convert $r = \sec\theta$ to rectangular coordinates, and describe the resulting curve.

$$r = \frac{1}{\cos\theta}$$

$$x = r\cos\theta$$
$$y = r\sin\theta$$

$$r\cos\theta = 1$$

$x = 1$ vertical line

Ex Convert and describe $r = 2\sin\theta + 2\cos\theta$

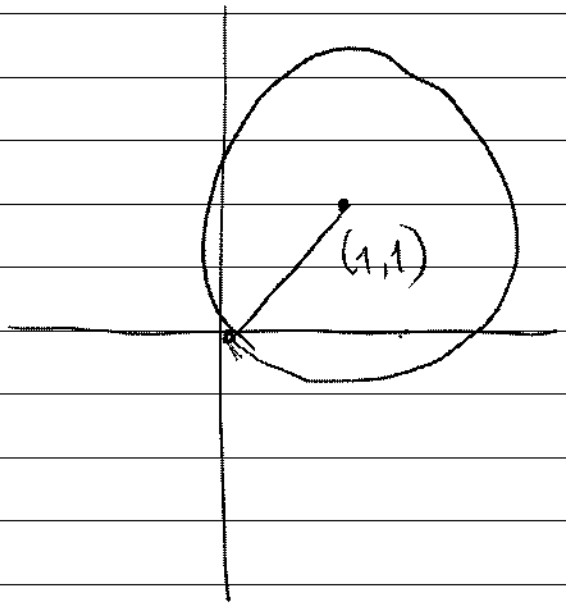
$$r^2 = 2r\sin\theta + 2r\cos\theta$$

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

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

$$(x^2 - 2x + 1) + (y^2 - 2y + 1) = 1 + 1$$

$$(x-1)^2 + (y-1)^2 = 2$$



Circle of radius $\sqrt{2}$ centered at $(1,1)$