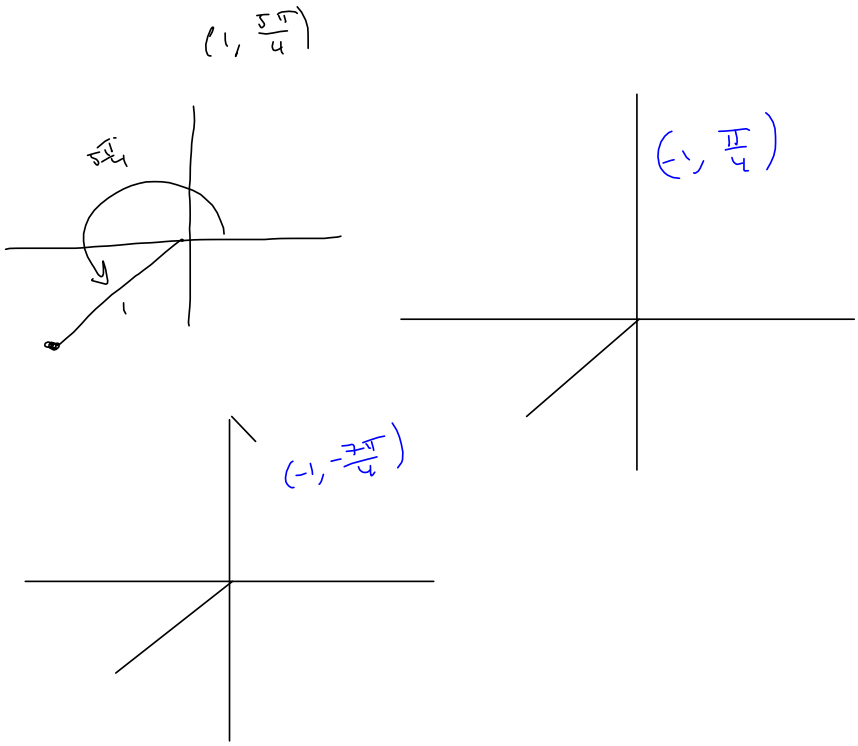
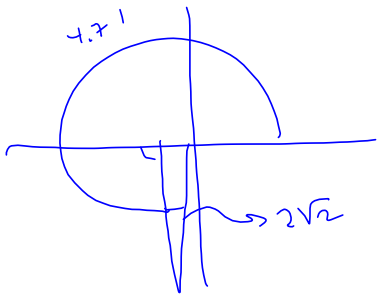
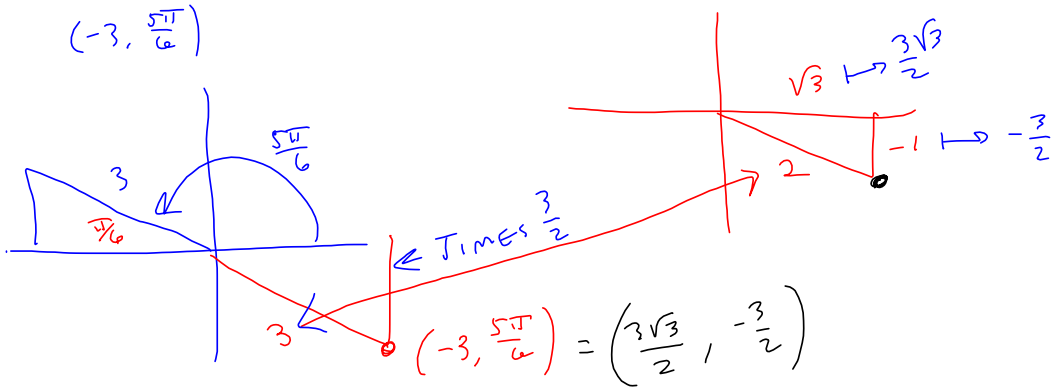

$(1, \frac{5\pi}{4})$
$\frac{5\pi}{4}$
1
$(-1, \frac{\pi}{4})$
$(-1, -\frac{7\pi}{4})$

$(4.71)\left(\frac{180^\circ}{\pi}\right)$

$(2\sqrt{2}, 4.71) = (r, \theta)$





$2x = 3$

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

$-3\left(\cos\frac{5\pi}{6}, \sin\frac{5\pi}{6}\right)$

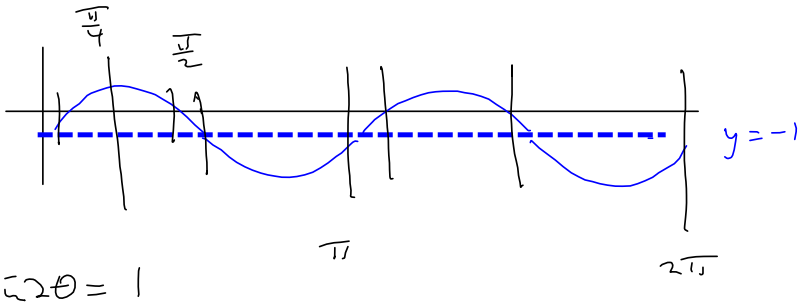
$= -3\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right) = \left(\frac{3\sqrt{3}}{2}, -\frac{3}{2}\right)$

Quick way to convert to rectangular from (r, θ): $(r\cos\theta, r\sin\theta)$!

Graph $2\sin(2\theta) - 1 = r$ in polar coords

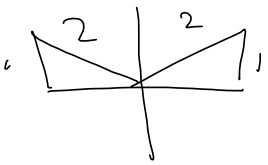
1. Graph in rectangular coords.
2. Interpret for polar graph

$2\sin(2\theta)$



$2\sin 2\theta = 1$

$\sin 2\theta = \frac{1}{2}$

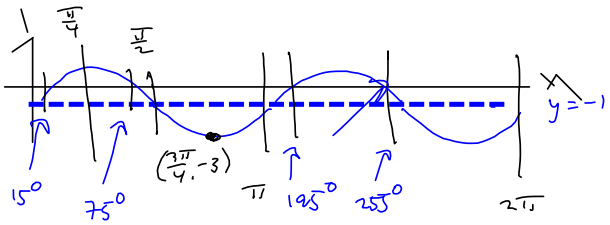


$\frac{\pi}{6}, \frac{\pi}{6}+2\pi, \frac{5\pi}{6}, \frac{5\pi}{6}+2\pi = 2\theta$

$\frac{\pi}{12}, \frac{\pi}{12}+\pi, \frac{5\pi}{12}, \frac{5\pi}{12}+\pi$

$\theta = \frac{\pi}{12}, \frac{13\pi}{12}, \frac{5\pi}{12}, \frac{17\pi}{12}$

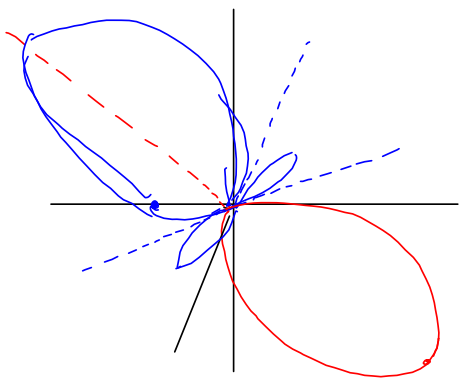
$15^\circ, 195^\circ, 75^\circ, 255^\circ$



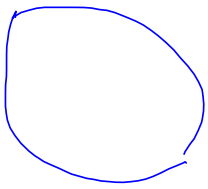
$\left(\frac{17\pi}{12}\right)\left(\frac{180^\circ}{\pi}\right)$

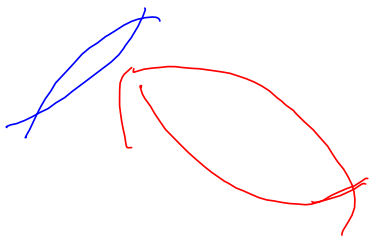
$= \frac{17 \cdot 30}{2}$

$= 17 \cdot 15$

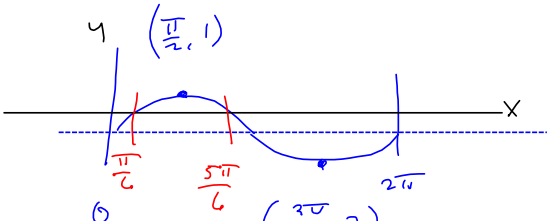


17.5
17
10 5
15 0
255





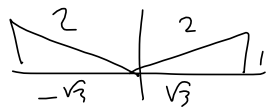
$r = 2\sin\theta - 1$

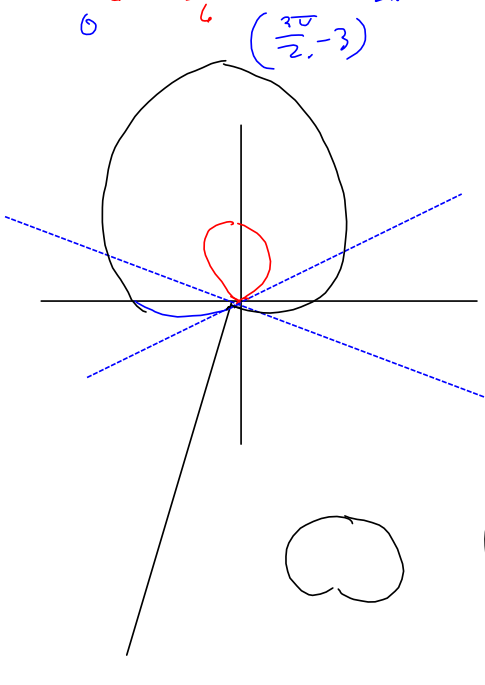


$y = -1$

$2\sin\theta = 1$

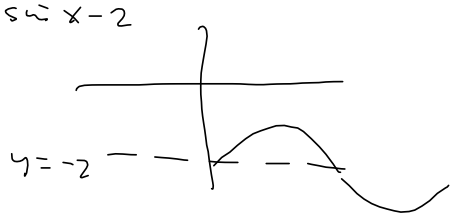
$\sin\theta = \frac{1}{2}$





$\sin\theta - 2$

$\sin x - 2$



$\sin x - 2$

$r = \sin\theta - 2$ has no loops!

Next Week:

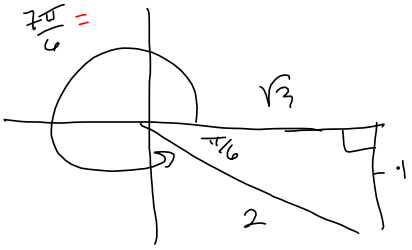
Testing

Tuesday OLDER MATERIAL.

Thursday NEW MATERIAL

$(r,\theta) \longmapsto (x,y) = (r\cos\theta, r\sin\theta)$

$r(\cos\theta + i\sin\theta)$

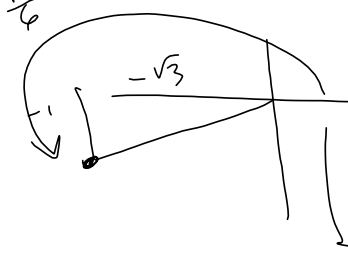


$(x,y) = (5\cos\frac{7\pi}{6}, 5\sin\frac{7\pi}{6})$

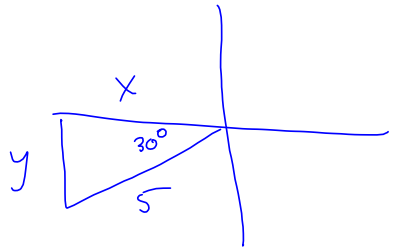
$= (5\cdot\frac{\sqrt{3}}{2}, 5\cdot(-\frac{1}{2}))$

$= \left(\frac{5\sqrt{3}}{2}, -\frac{5}{2}\right)$

Bad pic for $\frac{7\pi}{6}$ I drew $\frac{11\pi}{6}$



$\left(-\frac{5\sqrt{3}}{2}, -\frac{5}{2}\right) = (x,y)$



$\frac{x}{5} = \cos\frac{7\pi}{6}$

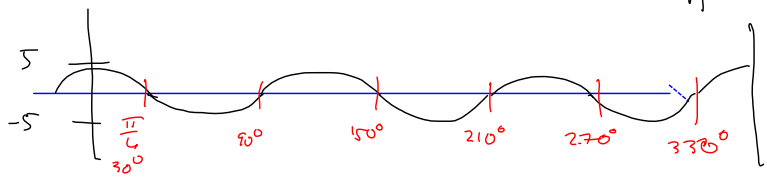
$\frac{y}{5} = \sin\frac{7\pi}{6}$

$r = 5\cos(3\theta)$ $\quad 5\cos 3\theta = 0$

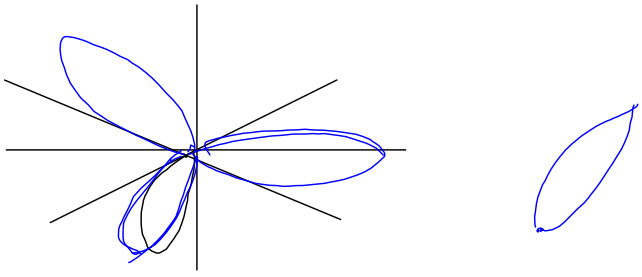
$\cos 3\theta = 0$

$3\theta = \frac{\pi}{2}, \frac{3\pi}{2}$

$3\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}, \frac{9\pi}{2}, \frac{11\pi}{2}$



$\theta = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$



3-petaled Rose

Matthew says that

$r\cos(2n\theta)$ has $2(2n)$ petals.

$r\cos((2n+1)\theta)$ $2n+1$ petals.

$5\cos(2\theta)$ 4 petals

$5\cos(7\theta)$ 7 petals

$5\cos(4\theta)$ 8 petals.

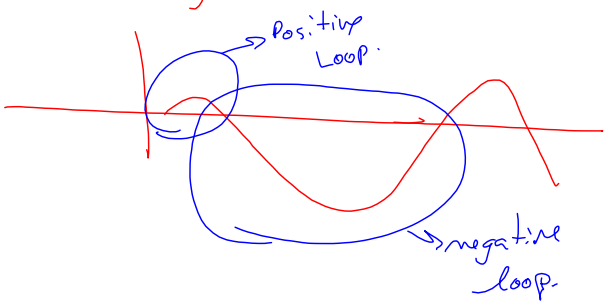
I'm more interested in the main SKILL than memorized minutiae.

→ Rectangular Graph.

Recognizing loops.

Handling negative r-values.

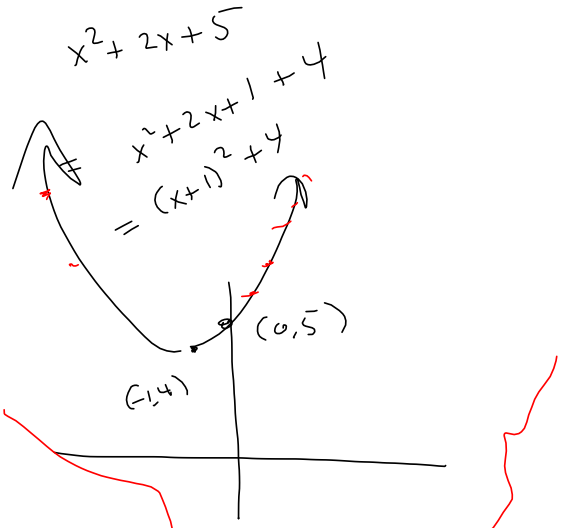
Going around the circle



x^2+2x+5

$x^2+2x+1+4$

$=(x+1)^2+4$



$x+2=\pm\sqrt{11}$

$x=-2\pm\sqrt{11}$

x^2+4x-7

$=x^2+4x+2^2-4-7$

$=(x+2)^2-11$