$r = 3\sin(2\theta)$ 4-petal rose

symmetry: (r,θ) by $(-r,-\theta)$ §6.8

$\theta = \frac{\pi}{2}$: $-r = 3\sin(-2\theta)$

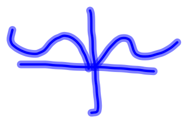
Yes $-r = -3\sin(2\theta)$

y-axis $r = 3\sin(2\theta)$ ✓

Graphing Calculator for homework.

Memorize symmetry tricks for tests.

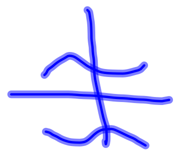
Polar Axis: $(r,-\theta)$ No $r = -\sin(2\theta)$



Yes $(-r, \pi - \theta)$

x-axis $-r = 3\sin(2(\pi-\theta))$

$-r = 3\sin(-2\theta + 2\pi)$

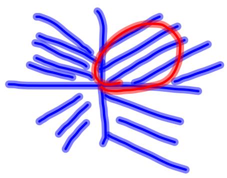


$-r = 3\sin(-2\theta)$

$-r = -3\sin(2\theta$ Yes

Pole: origin $(r, \theta+\pi)$

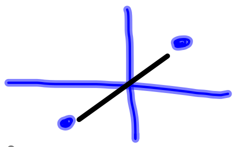
Yes



$r = 3\sin(2(\theta+\pi))$

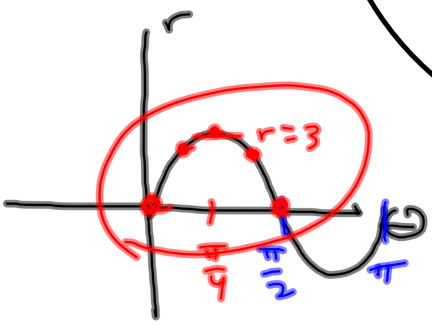
$r = 3\sin(2\theta + 2\pi)$

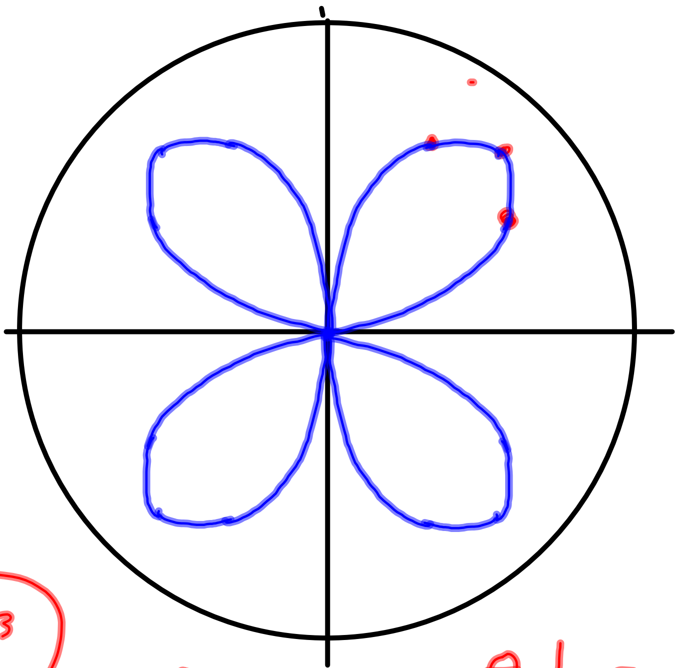
$r = 3\sin(2\theta)$ ✓



So basically just need 1st quadrant.

$r = 3\sin(2\theta)$





θ	r
0	0
30°	2.6
45°	3
60°	2.6

$3\sin(2(30^\circ))$

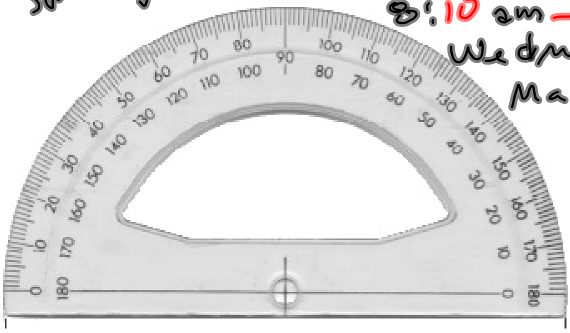
$= 3\sin(60^\circ)$

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

$3\sin((45)(2))$

$3\sin(120^\circ)$

Spirograph



Final
8:10 am – 10:00 am
Wednesday
May 7th

Final:
4.3, 4.4, 6.7
plus 1st 2 tests.

Find all solutions of $x^3 - 8 = 0$

$(x-2)(x^2+2x+4) = 0$

$\underline{x=2}$

$x^2+2x+4=0$

$x^2+2x+1^2 = -4+1^2$

$(x+1)^2 = -3$

$x+1 = \pm\sqrt{-3}$

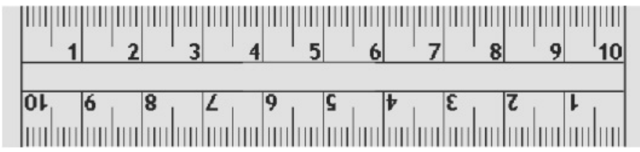
$x = -1 \pm i\sqrt{3}$

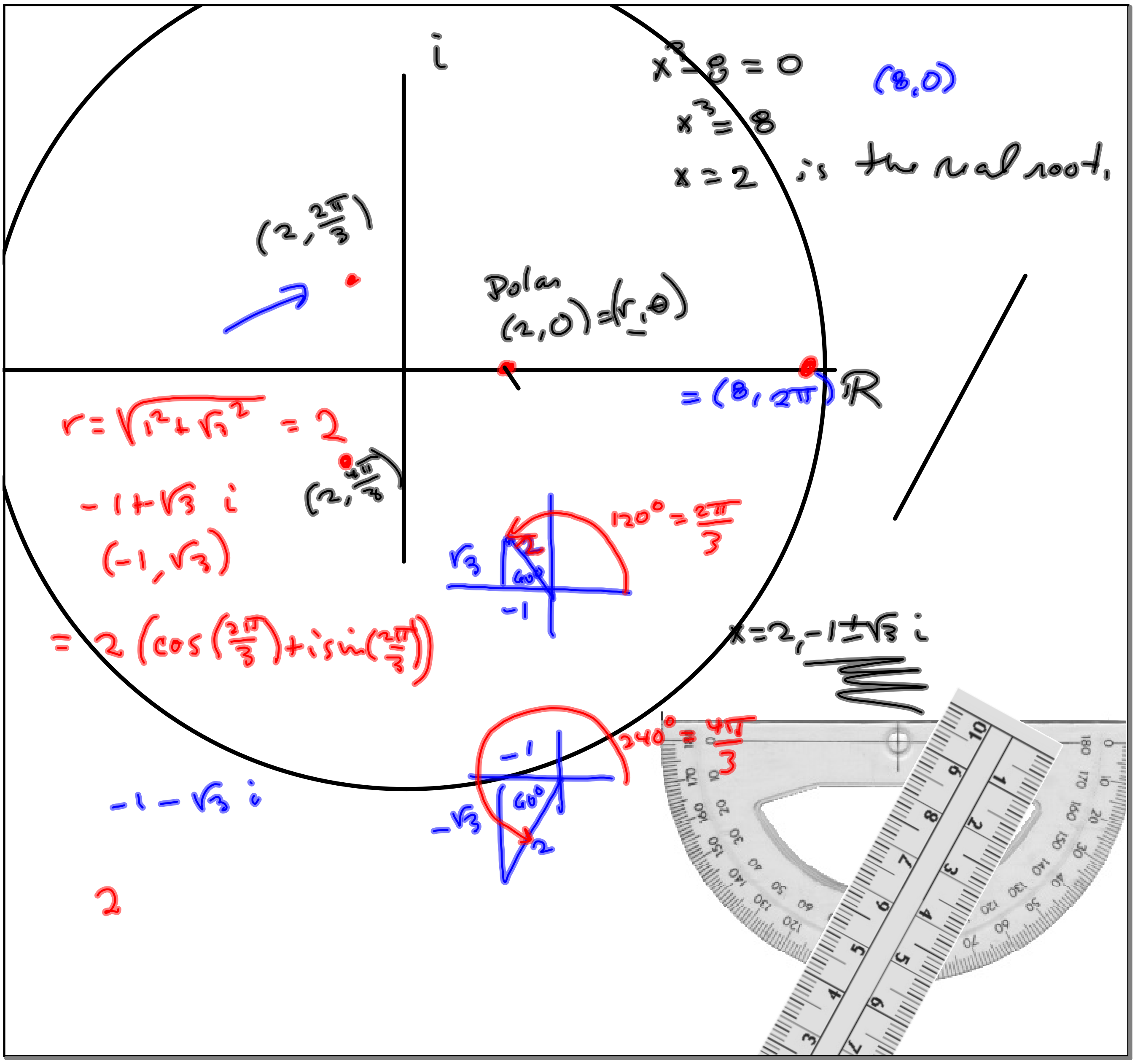
$x = 2, -1 \pm \sqrt{3}\, i$

$a^3 - b^3 = (a-b)(a^2+ab+b^2)$

Quadratic Formula is Fine

Completing the Square is big for recognizing circles, ellipses, hyperbolas & getting quick graphs.





$x^3 - 8 = 0$ $(8,0)$

$x^3 = 8$

$x = 2$ is the real root.

$(2,0) = (r,\theta)$

$= (8, 2\pi)$

$\left(2, \frac{2\pi}{3}\right)$

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

$r = \sqrt{1^2 + \sqrt{3}^2} = 2$

$-1 + \sqrt{3}\, i$

$(-1, \sqrt{3})$

$= 2\left(\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)\right)$

$120^\circ = \frac{2\pi}{3}$

$\sqrt{3}$ 2 60° -1

$x = 2, -1 \pm \sqrt{3}\, i$

$240^\circ = \frac{4\pi}{3}$

-1 60° $-\sqrt{3}$ 2

$-1 - \sqrt{3}\, i$

2

Apr 28-8:38 AM

~~Zeros~~ Roots evenly distributed around the circle. Cube roots of 8:

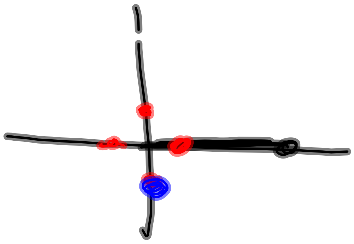
$$\sqrt[3]{8}\left(\cos\left(\frac{0+2\pi k}{3}\right)+i\sin\left(\frac{0+2\pi k}{3}\right)\right)$$

$k=0,1,2$

$k=0$: 2

$k=1$: $-1+i\sqrt{3}$

$k=2$: $-1-i\sqrt{3}$



Find me the 4^{th} roots 8:

$8 = 8(\cos(0)+i\sin(0))$

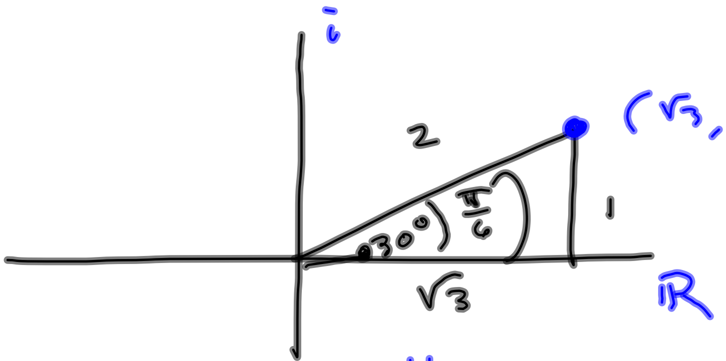
$\frac{2\pi k}{4}$: $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$

$k=0$: $\sqrt[4]{8}$

$k=1$: $\sqrt[4]{8}\left(\cos\left(\frac{\pi}{2}\right)+i\sin\left(\frac{\pi}{2}\right)\right) = \sqrt[4]{8}\, i$

$k=2$: $-\sqrt[4]{8}$

$k=3$: $-\sqrt[4]{8}\, i$



$(\sqrt{3}, 1) = \sqrt{3} + i$

$r = 2$

Find all 5^{th} roots!

Solve $x^5 = \sqrt{3} + i$

$\frac{2\pi}{5}$

5^{th} roots:

$$\frac{\frac{\pi}{6}}{5} = \frac{\pi}{30}$$

$k=0$ $\sqrt[5]{2}\left(\cos\left(\frac{\pi}{30}\right) + i\sin\left(\frac{\pi}{30}\right)\right)$

1 $\sqrt[5]{2}\left(\cos\left(\frac{13\pi}{30}\right) + i\sin\left(\frac{13\pi}{30}\right)\right)$

2 $\sqrt[5]{2}\left(\cos\left(\frac{5\pi}{6}\right) + i\sin\left(\frac{5\pi}{6}\right)\right)$

3 $\sqrt[5]{2}\left(\cos\left(\frac{37\pi}{30}\right) + i\sin\left(\frac{37\pi}{30}\right)\right)$

4 $\sqrt[5]{2}\left(\cos\left(\frac{49\pi}{30}\right) + i\sin\left(\frac{49\pi}{30}\right)\right)$

$$\frac{\pi}{30} + \frac{2\pi}{5}$$

$$= \frac{\pi + 12\pi}{30} = \frac{13\pi}{30}$$

$$\frac{13\pi}{30} + \frac{12\pi}{30}$$

$$\frac{25\pi + 12\pi}{30} =$$

$$\frac{37\pi + 12\pi}{30}$$

$\frac{2\pi}{n}$ is the angle you're adding each time.