Polar Graphs. An n-petal rose.

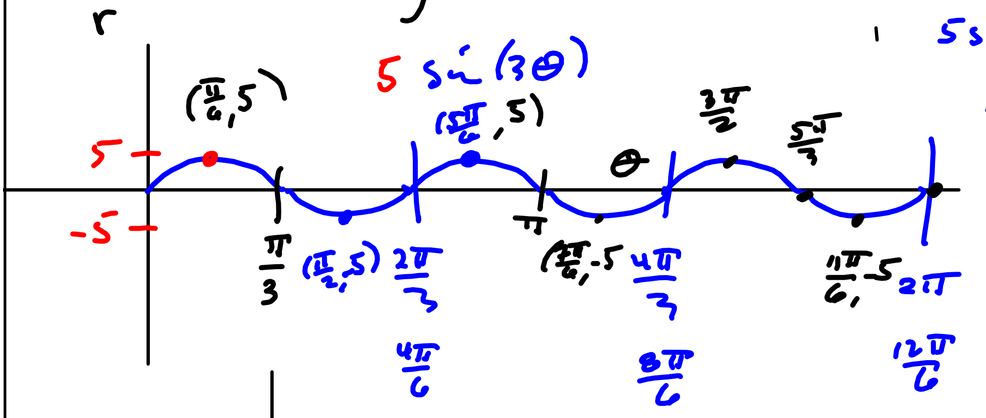
Bonus for symmetry checks.

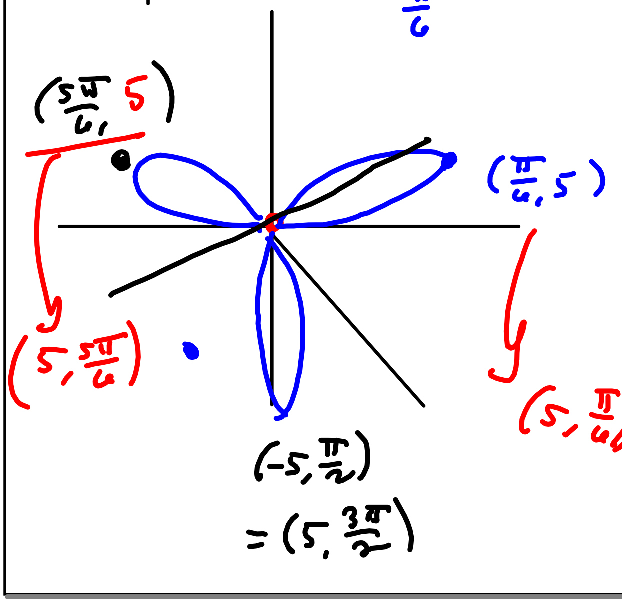
Something like $5\sin(3\theta)$

Period of $5\sin(3\theta)$ is $\frac{2\pi}{3}$

$3\theta = 2\pi$

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



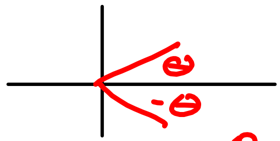


These are all (θ, r)'s instead of (r, θ)'s

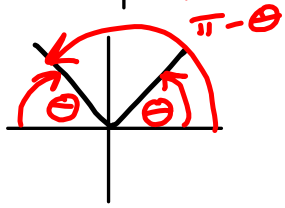
$(5, \frac{\pi}{6})$, idiot.

Check for 3 kinds of symmetry

(1) Polar (x-) axis

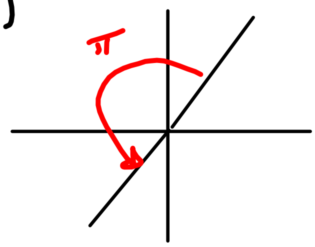


(2) $\theta = \frac{\pi}{2}$ (y-) axis



OR $(-r, -\theta)$

(3) Pole (origin)



$\theta + \pi$ OR $-r$

$r = 5\sin 3\theta$

(1) Polar axis : $r = 5\sin(3(-\theta))$

$= -5\sin(3\theta)$

$\theta = \frac{\pi}{2}$: $= -15 \sin\theta$ NO.

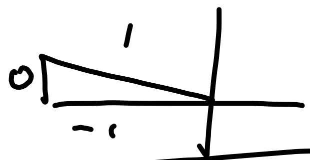
(2) $r = 5\sin 3\theta$

$r = 5\sin(3(\pi - \theta))$

$= 5\sin(3\pi - 3\theta)$

$= 5[\sin 3\pi \cos(-3\theta) + \cos(3\pi)\sin(-3\theta)]$

$= 5(-1)(-\sin(3\theta))$ $= 5\sin 3\theta$ Yes.



$-r = 5\sin(3(-\theta))$

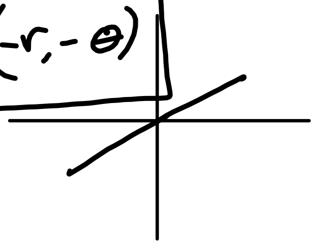
$-r = -5\sin(3\theta)$

$r = 5\sin(3\theta)$

Polar axis: $-\theta$;

Pole: $\pi + \theta$, $-r$

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



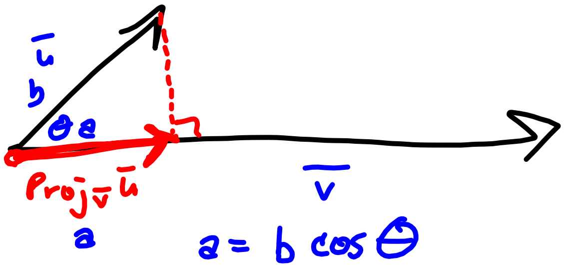
Vectors and the Law of Cosines.

Angle between vectors:

$$\cos\theta = \frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|}$$

$\bar{u} = \langle u_1, u_2\rangle$ $\quad \|\bar{u}\| = \sqrt{u_1^2 + u_2^2}$

$\bar{v} = \langle v_1, v_2\rangle$



$a = b\cos\theta$

$= \|\bar{u}\|\cos\theta = \|\bar{u}\| \frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|}$

$$\text{Proj}_{\bar{v}}\bar{u} = \frac{\bar{u}\cdot\bar{v}}{\|\bar{v}\|^2}\bar{v}$$

$=$

$\frac{\bar{v}}{\|\bar{v}\|}$ is a unit vector in the direction of $\bar{v}$.

a as a vector is

$\left(\|\bar{u}\|\cos\theta\right)\frac{\bar{v}}{\|\bar{v}\|} = \cancel{\|\bar{u}\|}\frac{\bar{u}\cdot\bar{v}}{\cancel{\|\bar{u}\|}\|\bar{v}\|}\frac{\bar{v}}{\|\bar{v}\|}$

$= \frac{\bar{u}\cdot\bar{v}}{\|\bar{v}\|^2}\bar{v}$