

Polar Curves You Should Know

Straight Lines

The polar equation for the (non-horizontal, non-vertical) line $y = mx + b$ (for $b \neq 0$) is

$$r(\theta) = \frac{b}{\sin \theta - m \cos \theta}.$$

It's not so simple for the others, though:

- To get lines $y = mx$ going through the origin, notice that

$$y = mx \implies \frac{y}{x} = m.$$

Now, $y/x = \tan \theta$, so $y = mx$ if and only if $\theta = \pm \arctan m$.

- To get the polar equations for the horizontal line $y = c$ and/or the vertical line $x = d$, use the polar-to-Cartesian identities $x = r \cos \theta$, $y = r \sin \theta$ and solve for r :

$$y = c \implies r \sin \theta = c \implies r = \frac{c}{\sin \theta} \quad \text{and} \quad x = d \implies r \cos \theta = d \implies r = \frac{d}{\cos \theta} = d \sec \theta.$$

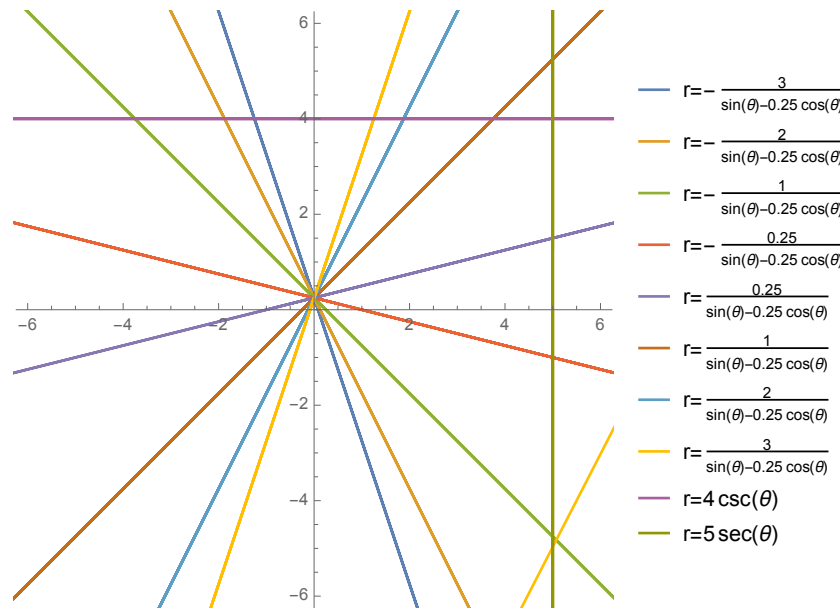


Figure 1

A collection of lines whose polar equations are given as above.