

## polar form of 'Conic Sections'

In polar coordinates, all conic sections can be described using

$$r(1 - e \cos \theta) = a$$

always with one focus at the origin.

circle has  $e = 0$   
so that  $r = a$   
for any  $\theta$

ellipse has  $|e| < 1$

Sketch is for  $e > 0$ :

What is  
the sketch  
for  $e < 0$ ?

Show that  
the other  
focus is at  $\left(\frac{2ea}{1 - e^2}, 0\right)$  in polar coordinates.

## polar form of 'Conic Sections'

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$$r(1 - e \cos \theta) = a$$

parabola has  $|e| = 1$

Sketch is for  $e = 1$ :

What is  
the sketch  
for  $e = -1$ ?

hyperbola has  $|e| > 1$

Sketch is for  $e > 1$ :

Asymptotes  
satisfy  
 $1 = e \cos \theta$ .

What is  
the sketch  
for  $e < -1$ ?