

Eccentricity of Conics

For ellipses, hyperbolas, and circles, the eccentricity of a conic is the ratio $c:a$, where c is the distance from each focus to the center of the conic section and a is the distance from each vertex to the center.

Eccentricity describes the shape of a conic. 

Eccentricity Summary

ellipse: $0 < e < 1$, $e = \frac{c}{a}$

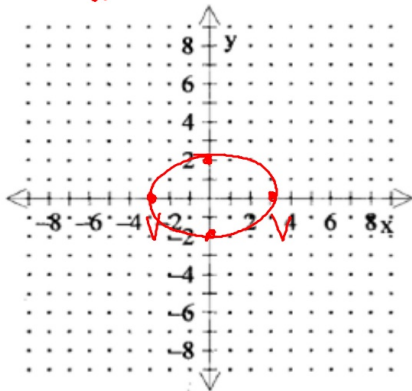
hyperbola: $e > 1$, $e = \frac{c}{a}$

circle: $e = 0$

examples: sketch each conic and find eccentricity

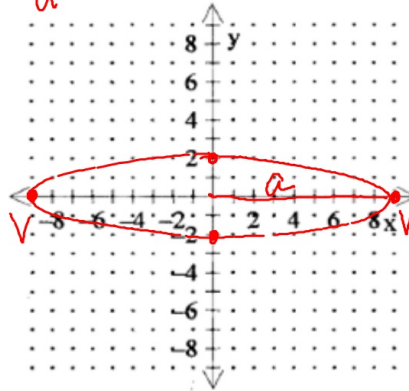
ex. 1

a) $\frac{x^2}{9} + \frac{y^2}{4} = 1$
 a^2



$$e = \frac{c}{a} = \frac{\sqrt{5}}{3}$$

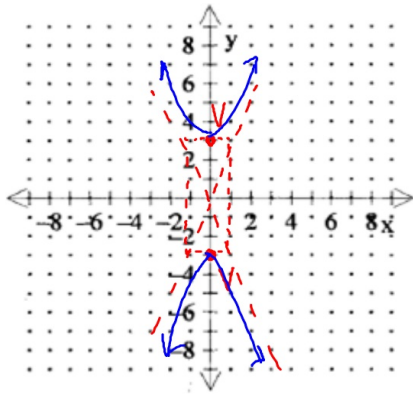
b) $\frac{x^2}{81} + \frac{y^2}{4} = 1$
 a^2



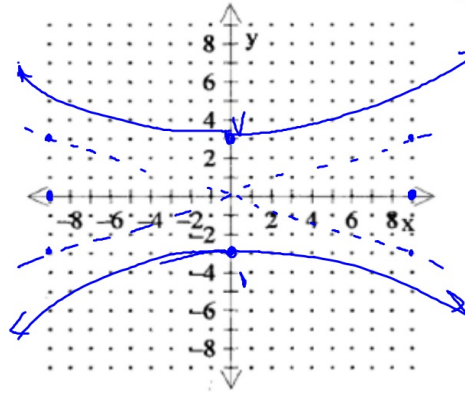
$$e = \frac{\sqrt{77}}{9}$$

ex. 2

a) $\frac{y^2}{9} - \frac{x^2}{1} = 1$ $e = \frac{c}{a} = \frac{\sqrt{10}}{3}$



b) $\frac{y^2}{9} - \frac{x^2}{81} = 1$ $e = \frac{c}{a} = \frac{\sqrt{90}}{3} = \frac{3\sqrt{10}}{3} = \sqrt{10}$



Eccentricity of Parabola = 1

= $\frac{\text{distance from focus to point on parabola}}{\text{distance from point to directrix}} = \frac{c}{c} = 1$

