

8.1, 8.2 & 8.3 Parabolas, Ellipses & Hyperbolas

Target 4A/4C/4E: Investigate the geometric properties of parabolas/ellipses/hyperbolas

Graphing Conic Sections By Hand

Equation	Type of Conic	Key Features	Graph
$\frac{x^2}{25} + \frac{y^2}{4} = 1$	Ellipse	Center: $(0,0)$ Vertices: $(5,0)$ $a^2=25$ $(-5,0)$ $a=5$ Foci: $(\sqrt{21},0)$ $a^2=b^2+c^2$ $(-\sqrt{21},0)$ $25=4+c^2$ $21=c^2$ $\sqrt{21}=c$ Semi-major axis: 5 $b^2=4$ $b=2$ Semi-minor axis: 2 Eccentricity: $e=\sqrt{21}/5$ Focal axis: $y=0$	
$\frac{(x+2)^2}{4} - (y-3)^2 = 1$	Hyperbola	Center: $(-2,3)$ Vertices: $(0,3)$ $a^2=4$ $(-4,3)$ $a=2$ Foci: $(-2+\sqrt{5},3)$ $c^2=a^2+b^2$ $(-2-\sqrt{5},3)$ $c^2=4+1$ $c^2=5$ $c=\sqrt{5}$ Semi-transverse axis: 2 Semi-conjugate axis: 1 $b^2=1$ $b=1$ Asymptotes: $y=\pm\frac{1}{2}(x+2)+3$ Focal axis: $y=3$ Eccentricity: $e=\sqrt{5}/2$	
$(x-1)^2 = 8(y+5)$	Parabola	Vertex: $(1,-5)$ opens up $4p=8$ Focus: $(1,-3)$ $p=2$ Directrix: $y=-7$ Focal width: 8 (Latus rectum) Axis of symmetry: $x=1$	

Equation	Type of Conic	Key Features	Graph
$25x^2 - 16(y - 2)^2 = 400$ $\frac{25x^2 - 16(y - 2)^2}{400} = \frac{400}{400}$ $\frac{x^2}{16} - \frac{(y - 2)^2}{25} = 1$	<p>Hyperbola</p>	<p>Center: $(0, 2)$</p> <p>Vertices: $(4, 2)$ $(-4, 2)$</p> <p>Foci: $(\sqrt{41}, 2)$ $(-\sqrt{41}, 2)$</p> <p>Semi transverse axis: 4</p> <p>Semi conjugate axis: 5</p> <p>Asymptotes: $y = \pm \frac{5}{4}(x) + 2$</p> <p>Focal axis: $y = 2$</p> <p>Eccentricity: $e = \frac{\sqrt{41}}{4}$</p>	
$(y + 2)^2 = -4(x - 3)$	<p>Parabola</p>	<p>Vertex: $(3, -2)$</p> <p>Opens Left</p> <p>Focus: $(2, -2)$</p> <p>Directrix: $x = 4$</p> <p>Focal width (Latus rectum): 4</p>	
$9x^2 + 4y^2 = 36$ $\frac{9x^2}{36} + \frac{4y^2}{36} = \frac{36}{36}$ $\frac{x^2}{4} + \frac{y^2}{9} = 1$	<p>Ellipse</p>	<p>Center: $(0, 0)$</p> <p>Vertices: $(0, 3)$ $(0, -3)$</p> <p>Foci: $(0, \sqrt{5})$ $(0, -\sqrt{5})$</p> <p>Semi major axis: 3</p> <p>Semi minor axis: 2</p> <p>Focal axis: $x = 0$</p> <p>Eccentricity: $e = \frac{\sqrt{5}}{3}$</p>	

More Practice

Conics

<http://www.mathguide.com/lessons/ConicSections.html>

<https://www.khanacademy.org/math/precalculus/conics-precalc>

<http://math2.org/math/algebra/conics.htm>

<https://www.youtube.com/watch?v=la6jmezAgiw>

<https://youtu.be/5nxT6LQhXLM>

https://youtu.be/Z6cwpsDC_5A

Homework Assignment

p.579 #31,33,35; p.591 #13,15,16; p.600 #11,15,16