

**8.1, 8.2 & 8.3 Parabolas, Ellipses & Hyperbolas**

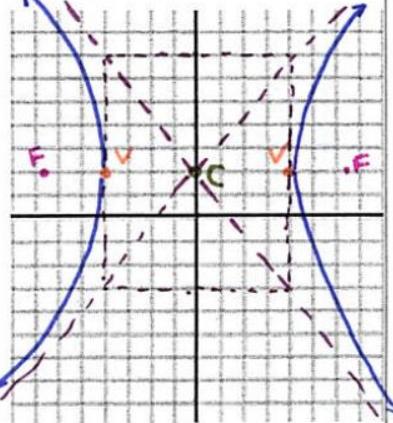
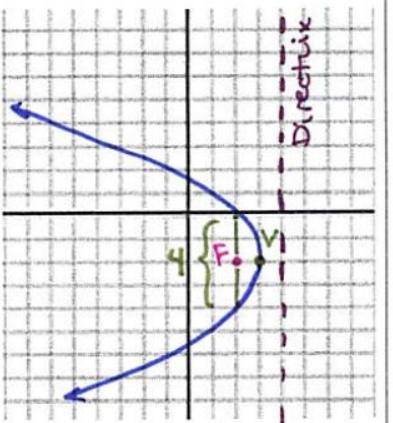
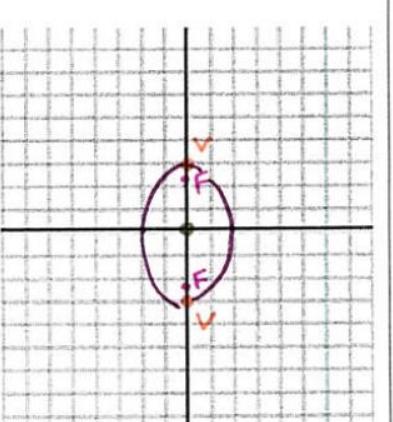
Target 4A/4C/4E: Investigate the geometric properties of parabolas/ellipses/hyperbolas

**Graphing Conic Sections By Hand**

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

## Unit 4 (Chapter 8): Conic Sections

## Pre-Calculus

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

**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](https://youtu.be/Z6cwpsDC_5A)

**Homework Assignment**

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