Conics

Non-Calculator

1. Find the vertex, focus and directrix of the parabola: $(x+1)^2 = 12(y-3)$

$4p = 12$
$p = 3$

vertex: $(-1, 3)$

focus: $(-1, 6)$

directrix: $y = 0$

2. Write the standard from of the equation of the parabola whose vertex is at $(0,2)$ and focus at $(0,5)$.

$(x-h)^2 = 4p(y-k)$

$p \rightarrow$ distance btn vertex + focus

$p = 3$

$(x-0)^2 = 4(3)(y-2)$

$\boxed{x^2 = 12(y-2)}$
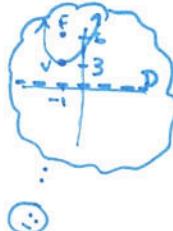
3. Sketch the graph of: $\frac{(x+2)^2}{16} - \frac{(y+1)^2}{9} = 1$. Label the center, vertices, and foci
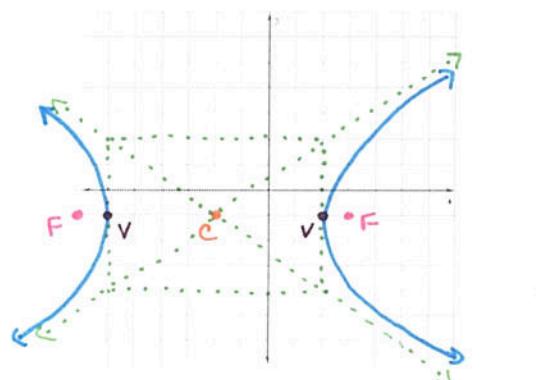
center: $(-2, -1)$
vertices: $(2, -1)$ and $(-6, -1)$

$a^2 = 16$
$a = 4$

foci: $(3, -1)$ and $(-7, -1)$

$c^2 = 16 + 9$
$c^2 = 25$
$c = 5$

4. Identify the type of conic and find the center, vertices, and foci:
$$\frac{(x-2)^2}{25} + \frac{y^2}{16} = 1$$

Ellipse $\frac{(x-2)^2}{5^2} + \frac{y^2}{4^2} = 1$

center: $(2, 0)$

$a^2 = 25$
$a = 5$

vertices: $(7, 0)$ and $(-3, 0)$

foci: $(5, 0)$ and $(-1, 0)$

$25 = c^2 + 16$
$9 = c^2$
$3 = c$

5. Write the equation of the conic from the given graph.
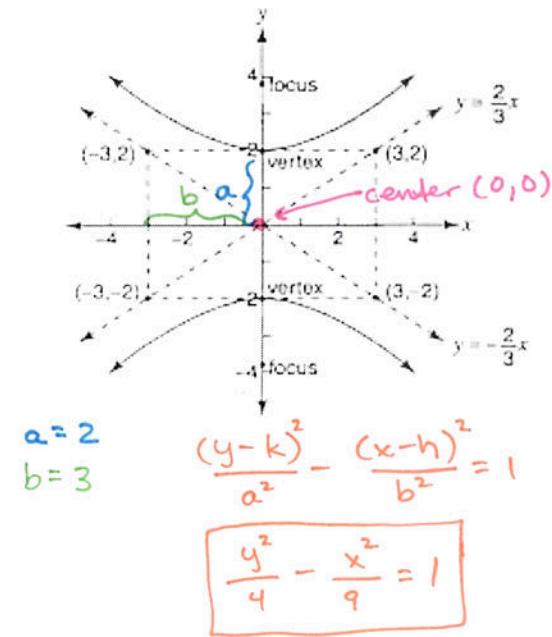
$a = 2$
$b = 3$

$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

$\boxed{\frac{y^2}{4} - \frac{x^2}{9} = 1}$
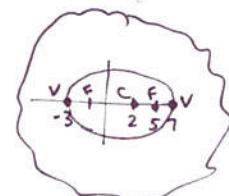
6. Write the equation of the conic from the given graph.
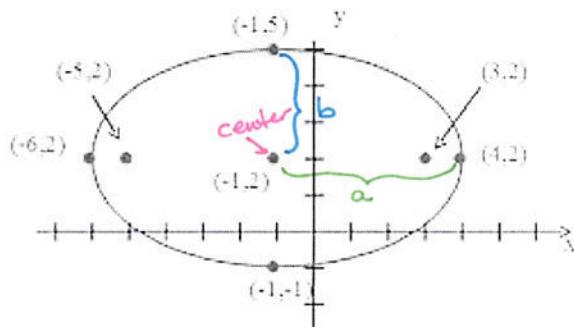
$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

$\frac{(x--1)^2}{25} + \frac{(y-2)^2}{9} = 1$

$a = 5$
$b = 3$

$\boxed{\frac{(x+1)^2}{25} + \frac{(y-2)^2}{9} = 1}$

Calculator

For each problem, identify the type of conic section and any key features of the conic section.

7. $\dfrac{(x-2)^2}{25} - \dfrac{(y+3)^2}{4} = 1$

* Hyperbola *

"East-West" ☺

Center: $(2, -3)$

vertices: $(-3, -3)$ and $(7, -3)$

foci: $(-3.385, -3)$ and $(7.385, 3)$

axes of symmetry: $y = -3$ and $x = 2$

asymptotes: $y = \dfrac{2}{5}x - \dfrac{19}{5}$

and $y = \dfrac{-2}{5}x - \dfrac{11}{5}$

eccentricity: $1.077 = e$

8. $(x+4)^2 + y^2 = 11$

* Circle *

center: $(-4, 0)$

radius: $\sqrt{11}$ or 3.317

9. $(y+1)^2 = 5(x-3)$

* Parabola *

$\dfrac{1}{5}(y+1)^2 = x - 3$

$\dfrac{1}{5}(y+1)^2 + 3 = x$

vertex: $(3, -1)$

focus: $\left(\dfrac{17}{4}, -1\right)$

directrix: $x = \dfrac{7}{4}$

axis of symmetry: $y = -1$

focal width: 5

eccentricity: $e = 1$

10. $\dfrac{y^2}{21} + \dfrac{(x-1)^2}{16} = 1$

* Ellipse *

$\dfrac{y^2}{(\sqrt{21})^2} + \dfrac{(x-1)^2}{4^2} = 1$

Center: $(1, 0)$

vertices: $(1, 4.583)$ and $(1, -4.583)$

foci: $(1, 2.236)$ and $(1, -2.236)$

axes of symmetry: $x = 1$ and $y = 0$

eccentricity: