November 29, 2023

Conic Sections Review

Circles

$$\frac{2x^2}{2}+\frac{2y^2}{2}+\frac{12x}{2}-\frac{8y}{2}=\frac{54}{2}$$

$$x^2+y^2+6x-4y=27$$

$$x^2+6x+9+y^2-4y+4=27+9+4$$

$+3$ $\quad -2$

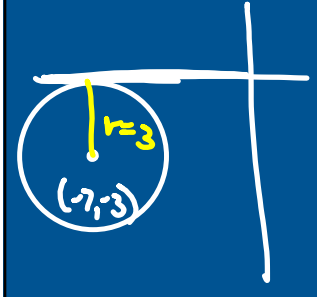
$$(x+3)^2+(y-2)^2=40 \qquad (\ )^2+(\ )^2=r^2$$

Center: $(-3, 2)$

radius: $\sqrt{r^2}=\sqrt{40}$

$4 \cdot 10$

$r=2\sqrt{10}$



Circle is tangent to x-axis.

$$(x+7)^2+(y+3)^2=(3)^2$$

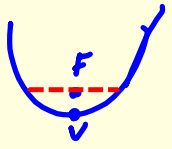
$$(x+7)^2+(y+3)^2=9$$

Parabola

$$x = -\frac{1}{16}(y-4)^2 + 2$$

Vertex: $(2, 4)$

Horiz



Line of Symm: $y = 4$

Direction: Left $(-1/16)$

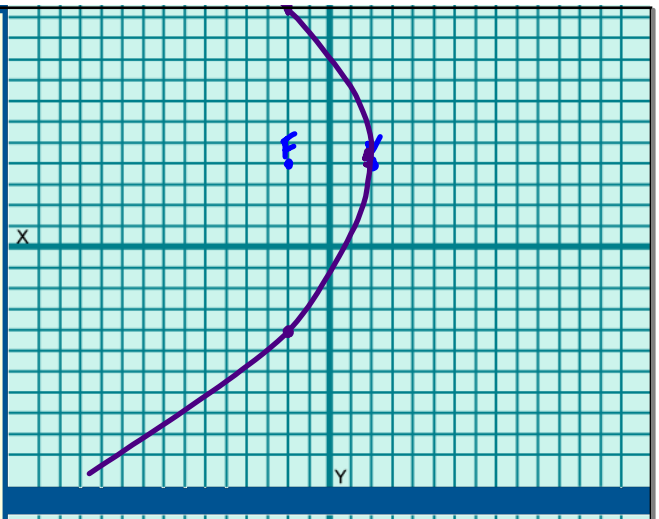
Focus: $\left(2 + \frac{1}{-\frac{1}{4}}, 4\right)$

$\left(2 + \frac{1}{-1/4}, 4\right)$

$(2 + -4, 4)$

$(-2, 4)$

Latus $\left|\frac{1}{a}\right| = \left|\frac{1}{-1/16}\right| = 16$



1) Plot vertex
2) Plot focus
3) ½ of latus on each side of focus

Ellipse

$9x^2 + 9y^2 + 36x - 40y + 100 = 0$

$9x^2 + 36x \quad + 9y^2 - 40y \quad = -100$

$9(x^2 + 4x + 4) + 9(y^2 - 10y + 25) = -100 + 36 + 100$

(+2 → +36; −5 → +100)

$\frac{9(x+2)^2}{36} + \frac{9(y-5)^2}{36} = \frac{36}{36}$

$\frac{(x+2)^2}{4} + \frac{(y-5)^2}{9} =$

Center $(-2, 5)$

$a = \sqrt{9} = 3$ (a is largest #)

$b = \sqrt{4} = 2$

Vertical (big # under y)

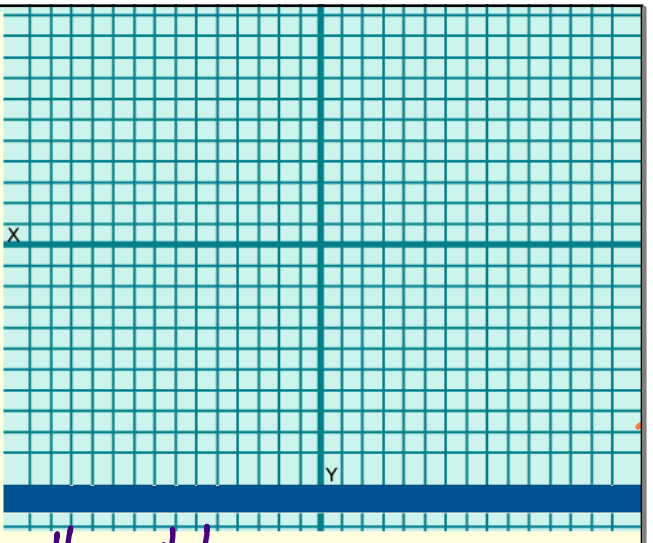
Foci $c^2 = a^2 - b^2$ $\quad e = \frac{c}{a}$

$c^2 = 9 - 4$

$c^2 = 5$

$c = \sqrt{5}$

$(-2, 5 \pm \sqrt{5})$



Hyperbola

$\frac{(x+2)^2}{4} - \frac{(y-5)^2}{9} = 1$

Center $(-2, 5)$

$a = \sqrt{4} = 2$ (a is 1st #)

$b = \sqrt{9} = 3$

Horizontal (x is 1st)

$c^2 = a^2 + b^2$

$c^2 = 4 + 9$

$c^2 = 13$

$c = \sqrt{13}$

Foci: $(-2 \pm \sqrt{13}, 5)$

Vertices: $(-2 \pm 2, 5)$

$= (-4, 5)$

$(0, 5)$

Slopes: $\pm b/a = \pm 3/2$