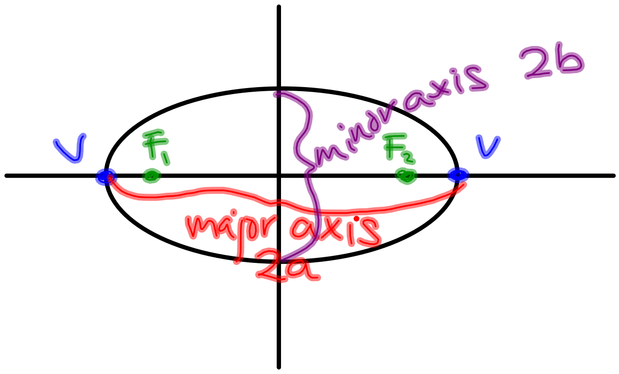
8.2 Ellipses

obj: 1. Find the equation, vertices & foci of an ellipse.



May 3-9:14 AM

Ellipse w/ center (h,k)

Standard equation: $\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$ long $\frac{(y-k)^2}{a^2}+\frac{(x-h)^2}{b^2}=1$ tall

Foci: $(h \pm c, k)$ $(h, k \pm c)$

Vertices: $(h \pm a, k)$ $(h, k \pm a)$

Major axis: $2a$

Minor axis: $2b$

Pythagorean Relationship: $a^2 = b^2 + c^2$

May 3-9:52 AM

Find the vertices $ foci : $\frac{4x^2}{36} + \frac{9y^2}{36} = \frac{36}{36}$

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

a^2 bigger, b^2

$a = 3 \quad b = 2$

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

$9 = 4 + c^2$

$c = \sqrt{5}$

(h,k) : center : $(0,0)$

V: $(h \pm a, k)$

$= (\pm 3, 0)$

F : $(h \pm c, k)$

: $(\pm\sqrt{5}, 0)$

May 3-9:59 AM

Find vertices $ foci : $\frac{x^2}{16} + \frac{y^2}{7} = 1$

$a^2 \qquad b^2$

$a = 4 \quad b = \sqrt{7}$ center: $\underset{h,k}{(0,0)}$

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

$16 = 7 + c^2$

$c = 3$

V: $(h \pm a, k) = (\pm 4, 0)$

F: $(h \pm c, k) = (\pm 3, 0)$

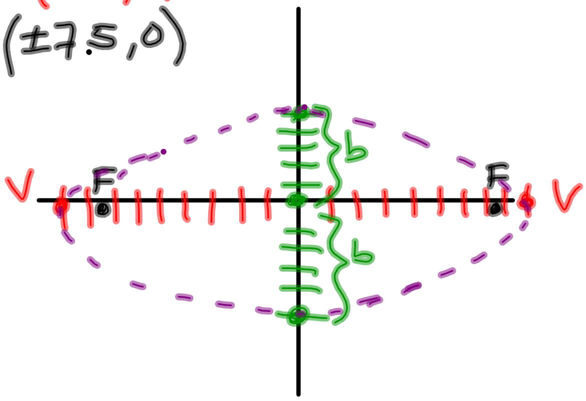
May 3-10:04 AM

Sketch: $\frac{x^2}{81}+\frac{y^2}{25}=1$

center: $(0,0)$

vertices: $(h\pm a, k) = (\pm 9, 0)$

foci: $(h\pm c, k) = (\pm 7.5, 0)$



$81=a^2$ $\quad 25=b^2$

$a=9$ $\quad b=5$

$81=25+c^2$

$c=\sqrt{56}\approx 7.5$

May 3-10:11 AM

Graph: $\underset{a^2}{\frac{y^2}{9}}+\underset{b^2}{\frac{x^2}{4}}=1$

$a=3$

$b=2$

$(h,k)=(0,0)$

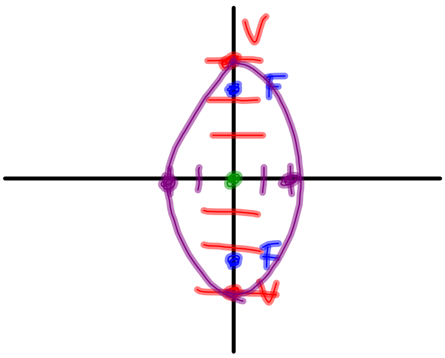
$V: (h, k\pm a) = (0, \pm 3)$

$9=4+c^2$

$c=\sqrt{5}$

$F: (h, k\pm c) = (0, \pm\sqrt{5})$

$(0, \pm 2.2)$

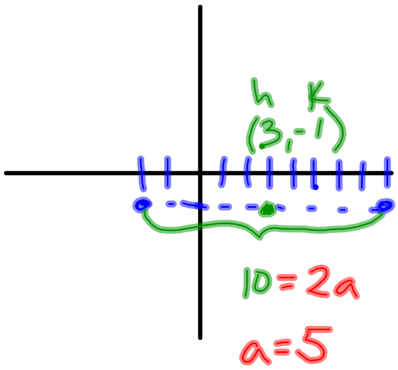


minor axis: $2b$
$=4$

May 3-10:16 AM

Find the equation for the ellipse w/ major axis endpoints $(-2,-1),(8,-1)$ and minor axis length 8.

$2b$
$b=4$



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

$$\frac{(x-3)^2}{\underset{25}{a^2}}+\frac{(y+1)^2}{\underset{16}{b^2}}=1$$

$$\frac{(x-3)^2}{25}+\frac{(y+1)^2}{16}=1$$

May 3-10:21 AM

Eccentricity: $e=\frac{c}{a}$
(off center)

May 3-10:25 AM

Prove: $9x^2+4y^2-18x+8y-23=0$ is an ellipse

$$(9x^2-18x)+(4y^2+8y)=23$$

$$9(x^2-2x)+4(y^2+2y)=23$$

$$9(x^2-2x+(-1)^2)+4(y^2+2y+1^2)=23+9+4$$

$$\frac{9(x-1)^2}{36}+\frac{4(y+1)^2}{36}=\frac{36}{36}$$

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

May 3-10:26 AM