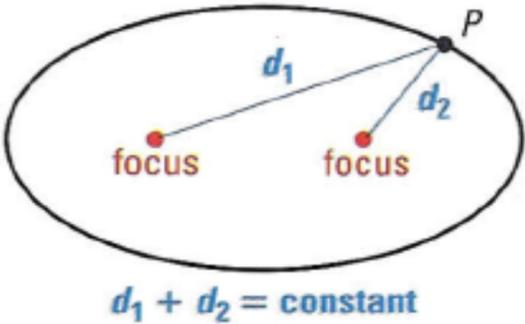


10-4 Ellipses

An **ellipse** is the set of all points P in a plane such that the sum of the distances from P to 2 fixed points (**foci**) is constant.



(textbook page 609)

vertex: $(-a, 0)$

vertex: $(a, 0)$

focus: $(-c, 0)$

focus: $(c, 0)$

co-vertex: $(0, b)$

co-vertex: $(0, -b)$

major axis

minor axis

center $(0,0)$

Ellipse with horizontal major axis

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

vertex: $(0, a)$

vertex: $(0, -a)$

focus: $(0, c)$

focus: $(0, -c)$

co-vertex: $(-b, 0)$

co-vertex: $(b, 0)$

major axis

minor axis

center $(0,0)$

Ellipse with vertical major axis

$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

$c^2 = a^2 - b^2$

Ex. 1

graph $\frac{49x^2}{441} + \frac{9y^2}{441} = \frac{441}{441}$ $\cdot \frac{x^2}{9} + \frac{y^2}{49} = 1$
 $b=7 \quad a=7$

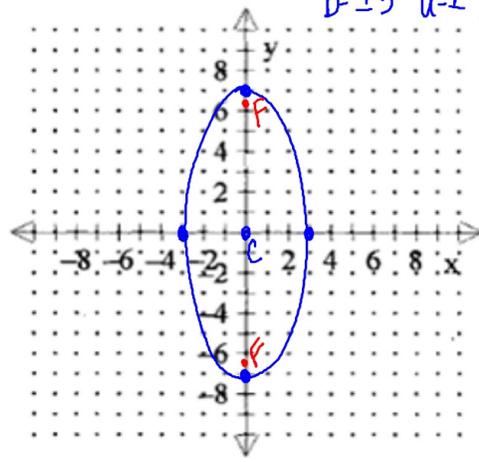
center $(0,0)$

vertices $(0, \pm 7)$

co-vertices $(\pm 3, 0)$

major axis y -axis

foci $c^2 = a^2 - b^2$
 $c^2 = 49 - 9 = 40$
 $c = \pm 2\sqrt{10}$
 $\approx \pm 6.3$
 $(0, 2\sqrt{10})$
 $(0, -2\sqrt{10})$



Ex. 2

graph $\frac{4(x-1)^2}{64} + \frac{16(y+2)^2}{4} = \frac{64}{64}$

center $(1, -2)$

vertices $(5, -2)$ $(-3, -2)$
 $a = \pm 4$

co-vertices $(1, 0)$ $(1, -4)$
 $b = \pm 2$

major axis horizontal

foci $c^2 = a^2 - b^2$
 $\sqrt{c^2} = \sqrt{12} \approx 3.5$
 $c = \pm 2\sqrt{3}$
 $(1+2\sqrt{3}, -2)$
 $(1-2\sqrt{3}, -2)$

