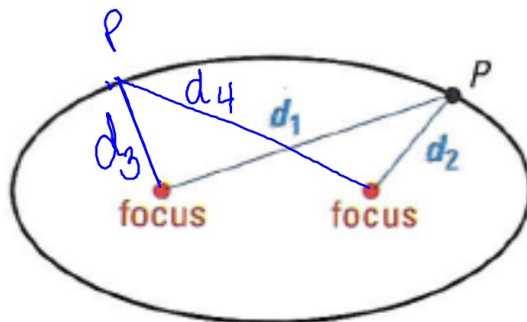


## 10-4 Ellipses



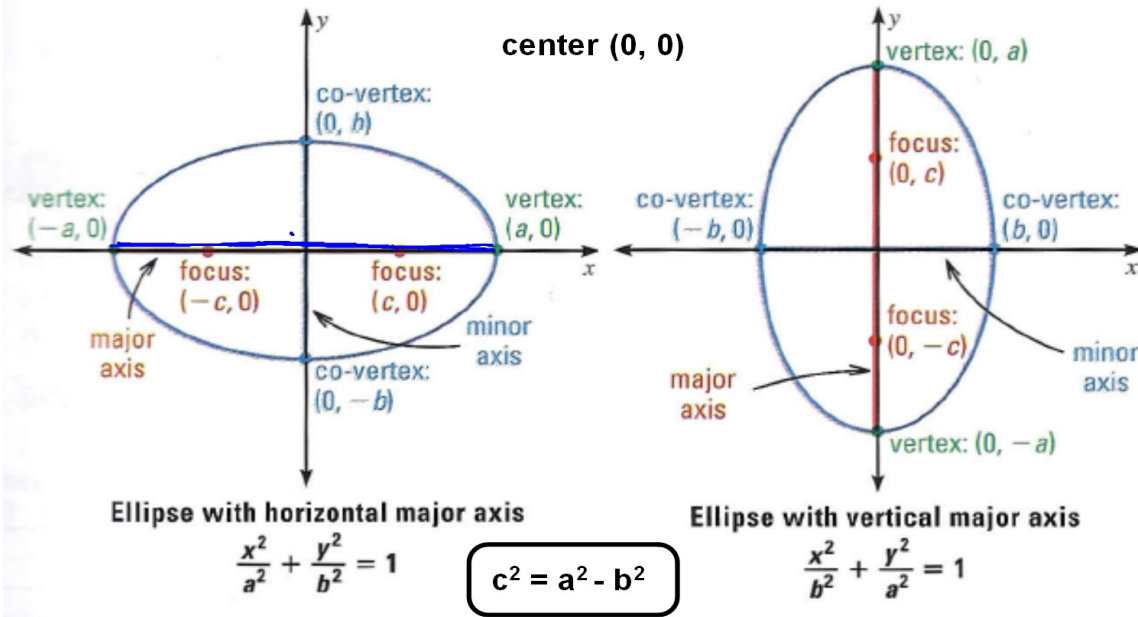
An **ellipse** is the set of all points  $P$  in a plane such that the sum of the distances from  $P$  to 2 fixed points (**foci**) is constant.



$$d_1 + d_2 = \text{constant}$$

$$d_3 + d_4 = \text{constant}$$

( textbook page 609)



**Ex. 1**

graph  $\frac{49x^2}{441} + \frac{9y^2}{441} = \frac{441}{441}$

$$\frac{(x-0)^2}{9} + \frac{(y-0)^2}{49} = 1$$

$\pm 3 \quad \pm 7$

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

vertices  $(0, \pm 7)$

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

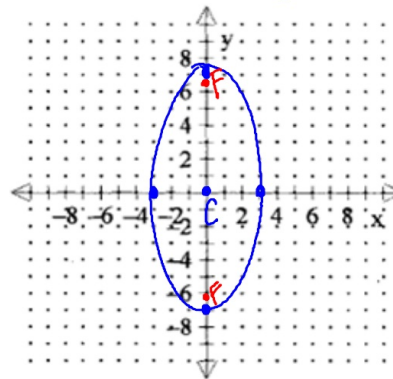
major axis  $y$ -axis

foci  $(0, \pm 2\sqrt{10})$

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

$$c^2 = 49 - 9 = 40$$

$$c = \pm 2\sqrt{10}$$



**Ex. 2** graph  $4(x - 1)^2 + 16(y + 2)^2 = 64$

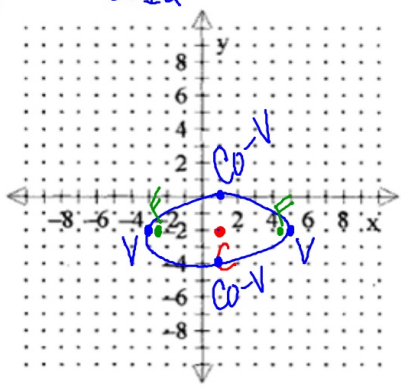
center  $(1, -2)$   $\frac{(x-1)^2}{16} + \frac{(y+2)^2}{4} = 1$

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

co-vertices  $(1, 0), (1, -4)$

major axis horizontal

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



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