

Ellipses

1. Graphing form Equation

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

Center (h, k)

* change both signs



Left + Right from

Center = $\sqrt{a^2} = a$

* a^2 under x .

up + down from center

$\sqrt{b^2} = b$.

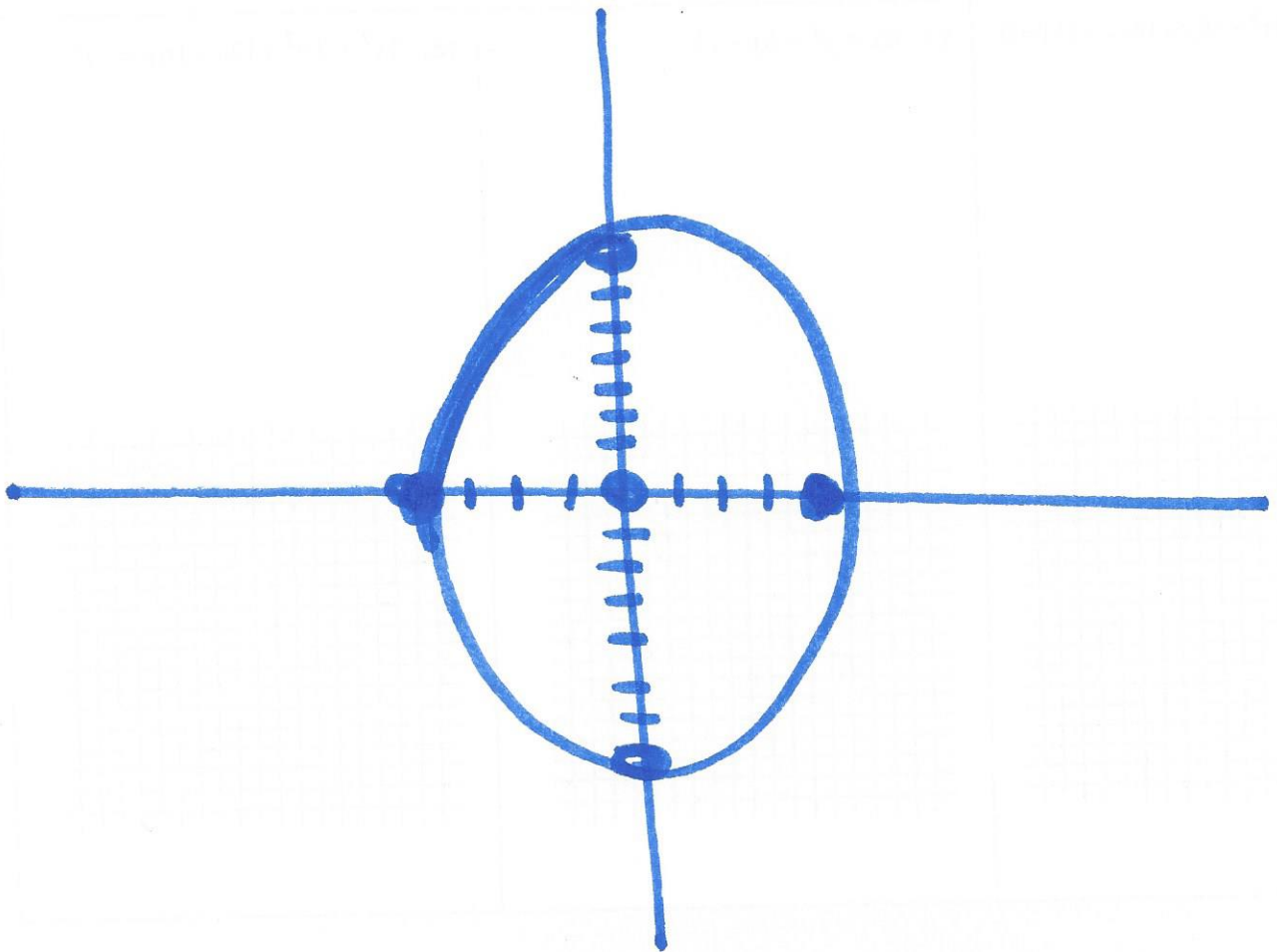
* b^2 under y .

2. $\frac{x^2}{16} + \frac{y^2}{49} = 1$

Center (0,0)

$\longleftrightarrow \sqrt{16} = 4$

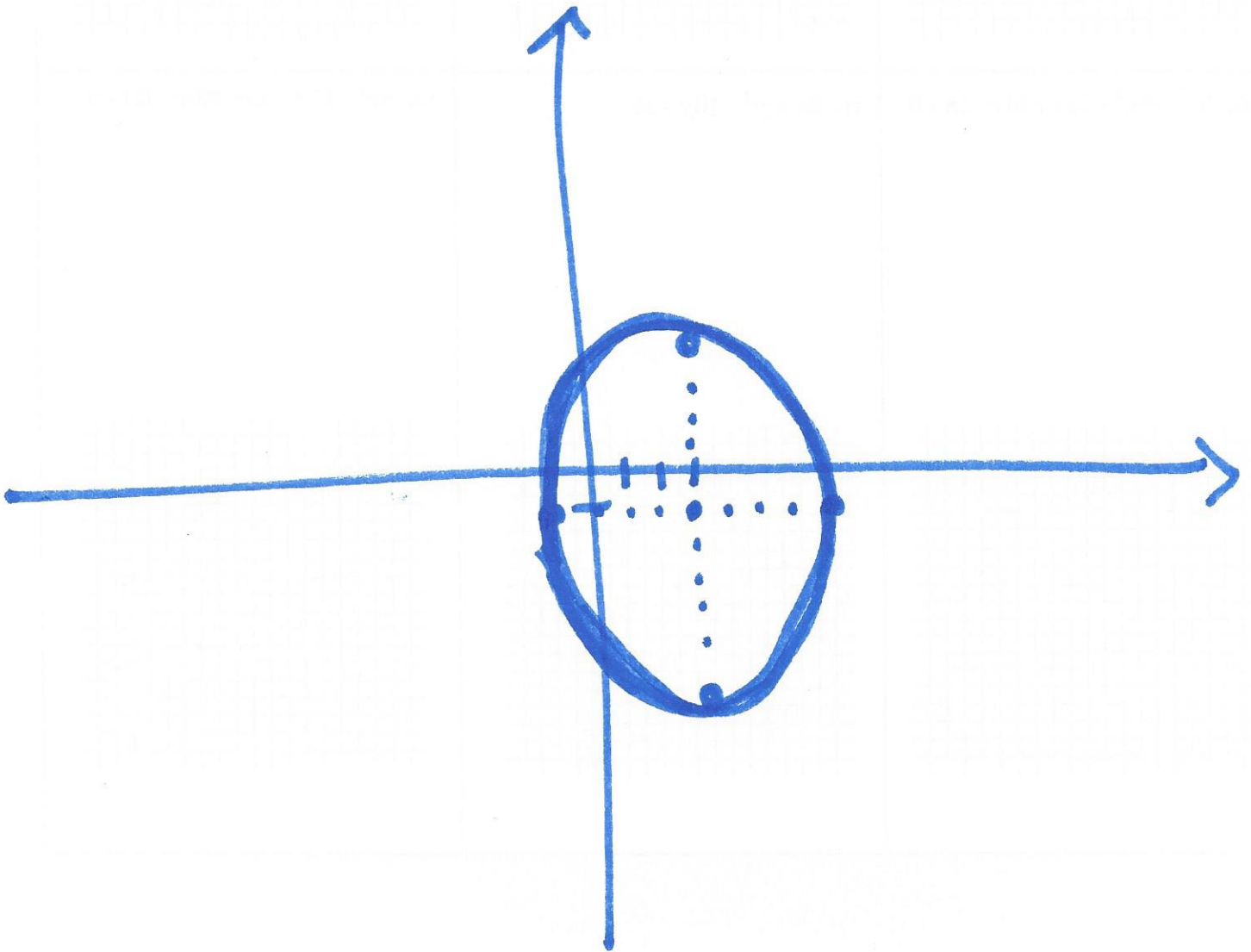
$\updownarrow \sqrt{49} = 7$



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

Center: $(3, -1)$

$\left\langle \begin{array}{l} \text{---} \\ \updownarrow \end{array} \right\rangle$ $\sqrt{16} = 4$
 $\sqrt{25} = 5$



$$4. \quad 4x^2 + y^2 - 8x - 8 = 0.$$

organize

move to other side.

$$4x^2 - 8x + \text{---} + y^2 = 8$$

a must = 1
to CTS.

already
perfect

$$4(x^2 - 2x + 1) + y^2 = 8 + 4$$

$$4(x-1)^2 + y^2 = 12$$

This is
the 1x4
From left
side.

** form needs to be = to 1
So divide all 3 terms by 12.

$$\frac{4(x-1)^2}{12} + \frac{y^2}{12} = \frac{12}{12}$$

center = (1, 0)

$$\frac{(x-1)^2}{3} + \frac{y^2}{12} = 1$$

$$\leftarrow \rightarrow$$

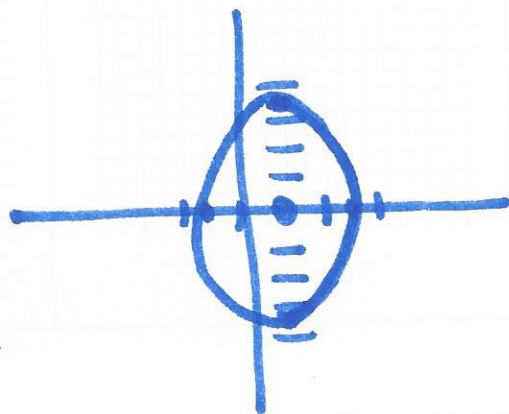
$$\sqrt{3}$$

$$\approx 1.7$$

$$\uparrow \downarrow$$

$$\sqrt{12}$$

$$\approx 3.5$$



$$5. \quad 9x^2 + 36y^2 + 54x - 144y - 99 = 0$$

organize

$$\left[9x^2 + 54x + \underline{\quad} \right] + 36y^2 - 144y = \textcircled{99}$$

factor out common for x

Factor out common from y

$$9 \left[x^2 + 6x + \underline{9} \right] + 36 \left(y^2 - 4y + \underline{4} \right)$$

$$\textcircled{+ 81}$$

= 9(9)
from x.

$$\textcircled{+ 144}$$

= 36(4)
from y

CTS

$$9 \left[\underset{\downarrow 3}{x+3} \right]^2 + 36 \left(\underset{\downarrow 2}{y-2} \right)^2 = \frac{99}{+81 + 144}$$

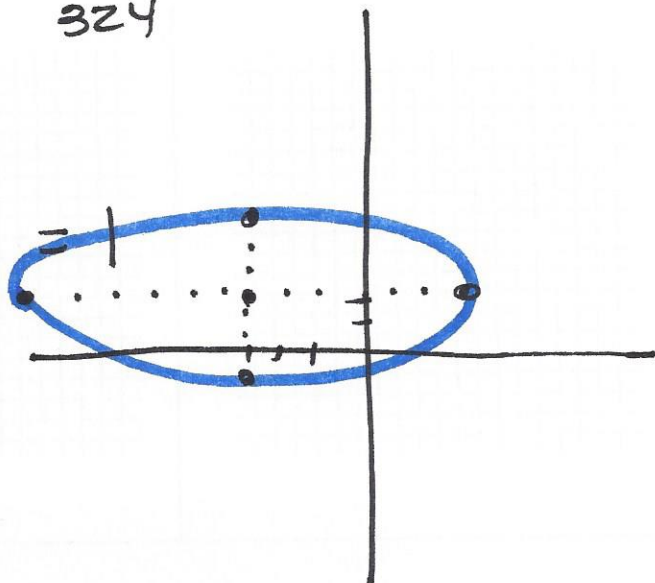
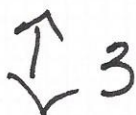
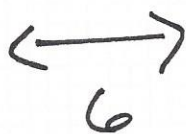
$$9(x+3)^2 + 36(y-2)^2 = 324$$

* don't panic. Divide all 3 terms by 324

$$\frac{\cancel{9}(x+3)^2}{\cancel{324} \quad 36} + \frac{\cancel{36}(y-2)^2}{\cancel{324} \quad 9} = \frac{324}{324}$$

$$\frac{(x+3)^2}{36} + \frac{(y-2)^2}{9}$$

Center
(-3, 2)



(6.)

$$5x^2 + 20y^2 + 30x + 40y - 15 = 0$$

$$5x^2 + 30x + \underline{\quad} + 20y^2 + 40y + \underline{\quad} = 15$$

$$5(x^2 + 6x + \underline{9}) + 20(y^2 + 2y + \underline{\quad}) = \overset{15+45}{+20}$$

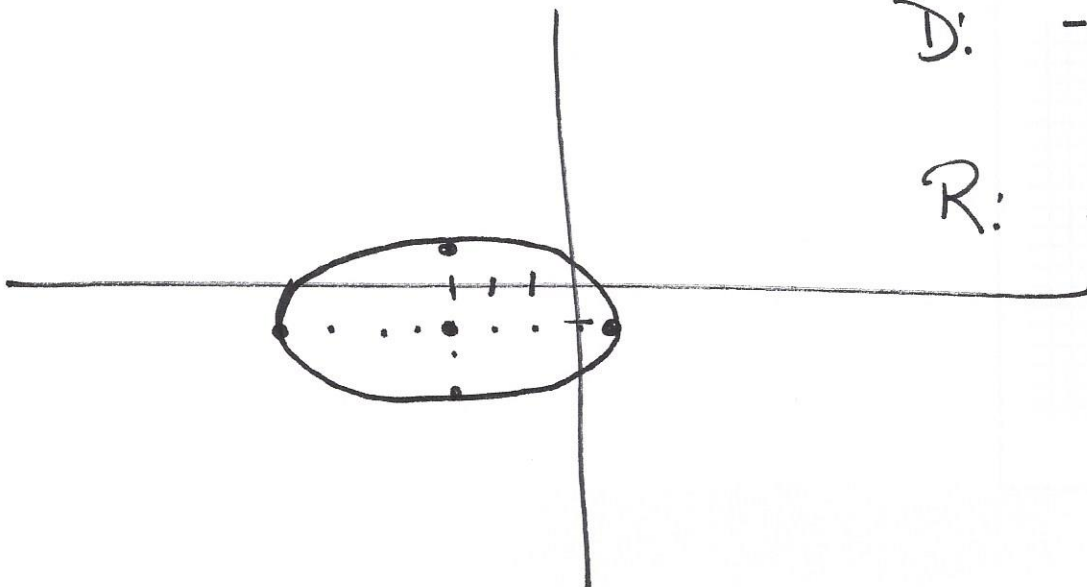
$$\frac{5(x+3)^2}{80} + \frac{20(y+1)^2}{80} = \frac{80}{80}$$

$$\frac{(x+3)^2}{16} + \frac{(y+1)^2}{4} = 1$$

Center $(-3, -1)$

$$\longleftrightarrow \sqrt{16} = 4$$

$$\updownarrow \sqrt{4} = 2$$



$$D: -3-4 \leq x \leq -3+4 \\ -10 \leq x \leq 1$$

$$R: -1-2 \leq y \leq -1+2 \\ -3 \leq y \leq 1$$