Examples 3 in Standard Forms

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Specify the center and the two main axes of each ellipse below, and then, graph it.

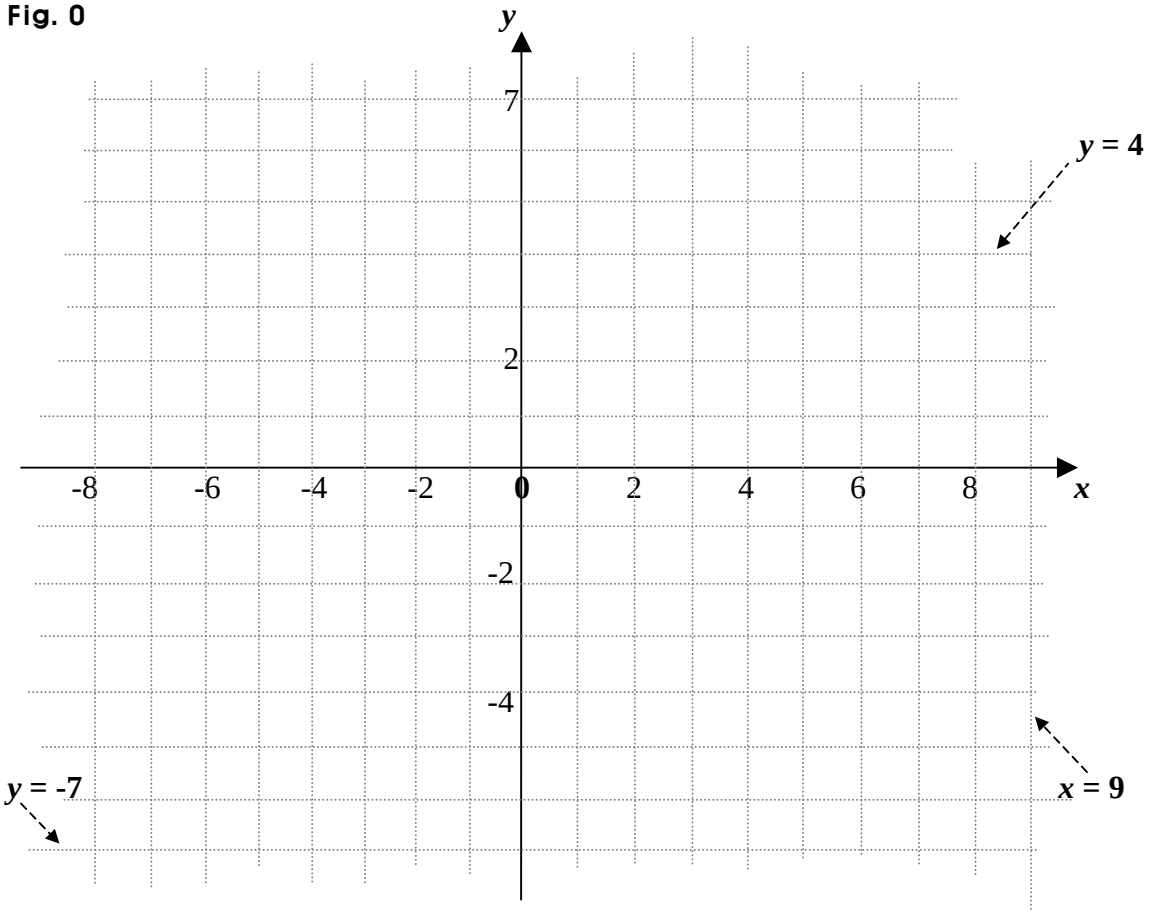
0. $\frac{(x+\frac{11}{2})^2}{\frac{25}{4}}+\frac{(y-\frac{13}{2})^2}{\frac{9}{4}}=1$ 1. $\frac{(x+6)^2}{9}+(y-5)^2=1$ 2. $\frac{(x+1)^2}{9}+\frac{(y-5)^2}{4}=1$

3. $(x-5)^2+4(y-7)^2=4$ 4. $(x-6)^2+4(y-\frac{7}{2})^2=9$ 5. $4(x+5)^2+9y^2=36$

6. $9x^2+16y^2=144$ 7. $4(x-3)^2+9(y+4)^2=36$ 8. $9(x-7)^2+16(y+\frac{5}{2})^2=36$

9. $9(x-3)^2+25(y+5)^2=225$ A. $(x+4)^2+4(y+\frac{11}{2})^2=9$

Fig. 0



Suggestions or Solutions
To the Problems in the Examples

Specify the center and the major and minor radii of each ellipse below, and then, graph it.

0. $\frac{(x+\frac{11}{2})^2}{\frac{25}{4}}+\frac{(y-\frac{13}{2})^2}{\frac{9}{4}}=1$ 1. $\frac{(x+6)^2}{9}+(y-5)^2=1$ 2. $\frac{(x+1)^2}{9}+\frac{(y-5)^2}{4}=1$

3. $(x-5)^2+4(y-7)^2=4$ 4. $(x-6)^2+4(y-\frac{7}{2})^2=9$ 5. $4(x+5)^2+9y^2=36$

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First, if an ellipse is **<u>horizontal</u>**, knowing the center and the major and minor radii, we can get the equation of the ellipse using the standard form, $\frac{(x-u)^2}{a^2}+\frac{(y-v)^2}{b^2}=1$, where (u, v) is the center, and $\underline{a > b}$, so a is the major radius, and b is the minor radius.

So beginning with 0, we can get $\frac{(x+\frac{11}{2})^2}{\frac{25}{4}}+\frac{(y-\frac{13}{2})^2}{\frac{9}{4}}=1\Rightarrow\frac{\{x-(-\frac{11}{2})\}^2}{(\frac{5}{2})^2}+\frac{(y-\frac{13}{2})^2}{(\frac{3}{2})^2}=1.$
So we can see that the ellipse is horizontal, the center is at $(-\frac{11}{2}, \frac{13}{2})$, the major radius is $\frac{5}{2}$, and the minor radius is $\frac{3}{2}$.

1. $\frac{(x+6)^2}{9}+(y-5)^2=1\Rightarrow\frac{\{x-(-6)\}^2}{3^2}+\frac{(y-5)^2}{1^2}=1.$ So we can see that the ellipse is horizontal, the center is (-6, 5), the major radius is 3, and the minor radius is 1.

2. $\frac{(x+1)^2}{9}+\frac{(y-5)^2}{4}=1\Rightarrow\frac{\{x-(-1)\}^2}{3^2}+\frac{(y-5)^2}{2^2}=1.$ So we can see that the ellipse is horizontal, the center is (-1, 5), the major radius is 3, and the minor radius is 2.

3. $(x-5)^2+4(y-7)^2=4 \Rightarrow \frac{(x-5)^2}{4}+(y-7)^2=1 \Rightarrow \frac{(x-5)^2}{2^2}+(y-7)^2=1.$

So the ellipse is horizontal, the center is (-1, 5), the major radius is 3, and the minor radius is 2.

4. $(x-6)^2+4(y-\frac{7}{2})^2=9 \Rightarrow \frac{(x-6)^2}{9}+\frac{4(y-\frac{7}{2})^2}{9}=1 \Rightarrow \frac{(x-6)^2}{3^2}+\frac{(y-\frac{7}{2})^2}{(\frac{3}{2})^2}=1.$

So the ellipse is horizontal, the center is $(6, \frac{7}{2})$, the major radius is 3, and the minor radius is $\frac{3}{2}$.

5. $4(x+5)^2+9y^2=36 \Rightarrow \frac{4(x+5)^2}{36}+\frac{9y^2}{36}=1 \Rightarrow \frac{(x+5)^2}{9}+\frac{y^2}{4}=1 \Rightarrow \frac{(x+5)^2}{3^2}+\frac{y^2}{2^2}=1.$

So the ellipse is horizontal, the center is (-5, 0), the major radius is 3, and the minor radius is 2.

6. $9x^2+16y^2=144 \Rightarrow \frac{9x^2}{144}+\frac{16y^2}{144}=\frac{x^2}{16}+\frac{y^2}{9}=\frac{x^2}{4^2}+\frac{y^2}{3^2}=1.$

So the ellipse is horizontal, the center is (0, 0), the major radius is 4, and the minor radius is 3.

7. $4(x-3)^2+9(y+4)^2=36 \Rightarrow \frac{(x-3)^2}{9}+\frac{(y+4)^2}{4}=\frac{(x-3)^2}{3^2}+\frac{(y+4)^2}{2^2}=1.$

So the ellipse is horizontal, the center is (3, -4), the major radius is 3, and the minor radius is 2.

8. $9(x-7)^2+16(y+\frac{5}{2})^2=36 \Rightarrow \frac{(x-7)^2}{4}+\frac{4(y+\frac{5}{2})^2}{9}=\frac{(x-7)^2}{2^2}+\frac{(y+\frac{5}{2})^2}{(\frac{3}{2})^2}=1.$

So the ellipse is horizontal, the center is $(7, -\frac{5}{2})$, the major radius is 2, and the minor radius is $\frac{3}{2}$.

9. $9(x-3)^2+25(y+5)^2=225 \Rightarrow \frac{(x-3)^2}{25}+\frac{(y+5)^2}{9}=\frac{(x-3)^2}{5^2}+\frac{(y+5)^2}{3^2}=1.$

So the ellipse is horizontal, the center is (3, -5), the major radius is 5, and the minor radius is 3.

A. $(x+4)^2+4(y+\frac{11}{2})^2=9 \Rightarrow \frac{(x+4)^2}{9}+\frac{4(y+\frac{11}{2})^2}{9}=\frac{(x+4)^2}{3^2}+\frac{(y+\frac{11}{2})^2}{(\frac{3}{2})^2}=1.$

So the ellipse is horizontal, the center is $(-4,-\frac{11}{2})$, the major radius is 3, and the minor radius is $\frac{3}{2}$.

And graphing the equations, we get

Fig. 1