

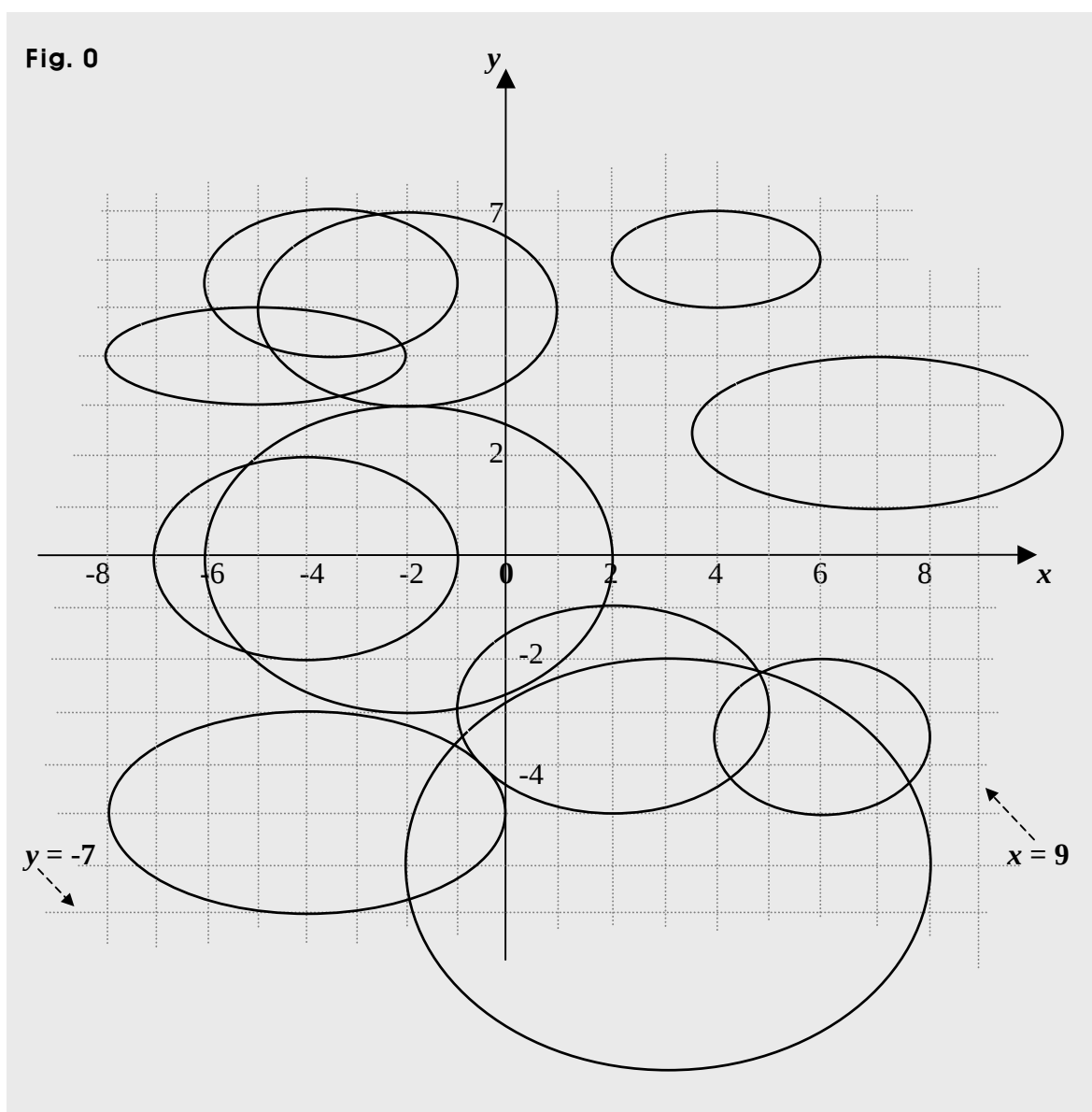
Examples 1 in Standard Forms

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Examples 1 in Standard Forms

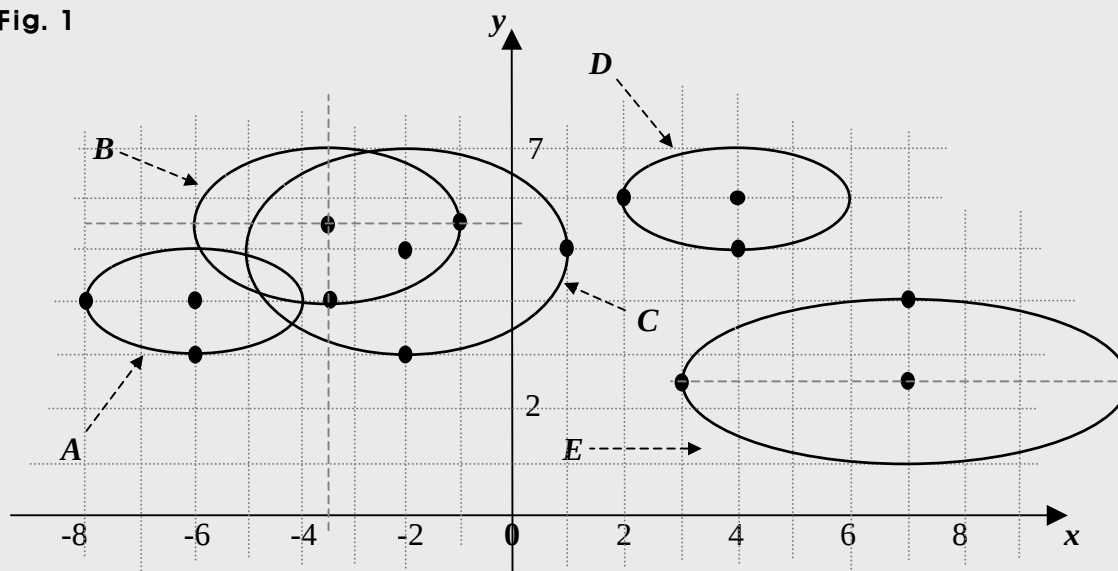
Label each ellipse below, and then find the equation of each of the ellipses.



Suggestions or Solutions To the Problems in the Examples

The ellipses are all horizontal, and beginning with the ellipses below, we can see first, the ellipse **A** is centered at $(-6, 4)$, the major radius is 2, and the minor radius is 1.

Fig. 1



And in the graph, we can find the center and the radii each of all the other ellipses has.

Next, if an ellipse is **horizontal**, 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 $\underline{a \geq b}$, so a is the major radius, and b is the minor radius.

And thus, beginning with the ellipse **A**, we can see it has the center at $(-6, 4)$, the major radius is 2, and the minor radius is 1. So we get $u = -6$, $v = 4$, $a = 2$, and $b = 1$.

Thus, we get $\frac{\{x - (-6)\}^2}{2^2} + \frac{(y-4)^2}{1^2} = 1 \Rightarrow \frac{(x+6)^2}{2^2} + \frac{(y-4)^2}{1^2} = 1$, which is the equation

of the ellipse **A**. And we can put it this way, too, of course: $\frac{(x+6)^2}{4} + (y-4)^2 = 1$.

And this way, as well: $(x+6)^2 + 4(y-4)^2 = 4$.

Next, looking at the ellipse **B**, we can see it has the center at $(-\frac{7}{2}, \frac{11}{2})$, the major radius is $\frac{5}{2}$, and the minor radius is $\frac{3}{2}$. So we get $u = -\frac{7}{2}$, $v = \frac{11}{2}$, $a = \frac{5}{2}$, and $b = \frac{3}{2}$.

Thus, we get $\frac{\{x - (-\frac{7}{2})\}^2}{(\frac{5}{2})^2} + \frac{(y - \frac{11}{2})^2}{(\frac{3}{2})^2} = 1 \Rightarrow \frac{(x + \frac{7}{2})^2}{(\frac{5}{2})^2} + \frac{(y - \frac{11}{2})^2}{(\frac{3}{2})^2} = 1$, which is the equation

of the ellipse **B**, and can be put this way, too: $\frac{(x + \frac{7}{2})^2}{\frac{25}{4}} + \frac{(y - \frac{11}{2})^2}{\frac{9}{4}} = 1$.

And this way, as well: $\frac{4(x + \frac{7}{2})^2}{25} + \frac{4(y - \frac{11}{2})^2}{9} = 1$ or $\frac{(x + \frac{7}{2})^2}{25} + \frac{(y - \frac{11}{2})^2}{9} = \frac{1}{4}$.

Looking at next, the ellipse **C**, we can see the center is $(-2, 5)$, the major radius is 3, and the minor radius is 2. So we get $u = -2$, $v = 5$, $a = 3$, and $b = 2$.

Thus, we get $\frac{\{x - (-2)\}^2}{3^2} + \frac{(y - 5)^2}{2^2} = 1 \Rightarrow \frac{(x + 2)^2}{3^2} + \frac{(y - 5)^2}{2^2} = 1$, which is the equation

of the ellipse **C**, and can be put this way, too: $\frac{(x + 2)^2}{9} + \frac{(y - 5)^2}{4} = 1$.

And this way, as well: $4(x + 2)^2 + 9(y - 5)^2 = 36$.

Next, examining the ellipse **D**, we can see the center is $(4, 6)$, the major radius is 2, and the minor radius is 1. So we get $u = 4$, $v = 6$, $a = 2$, and $b = 1$.

Thus, we get $\frac{(x - 4)^2}{2^2} + \frac{(y - 6)^2}{1^2} = 1$, which is the equation of the ellipse **D**, and can be

put this way, too: $\frac{(x - 4)^2}{4} + (y - 6)^2 = 1$. And this way, as well: $(x - 4)^2 + 4(y - 6)^2 = 4$.

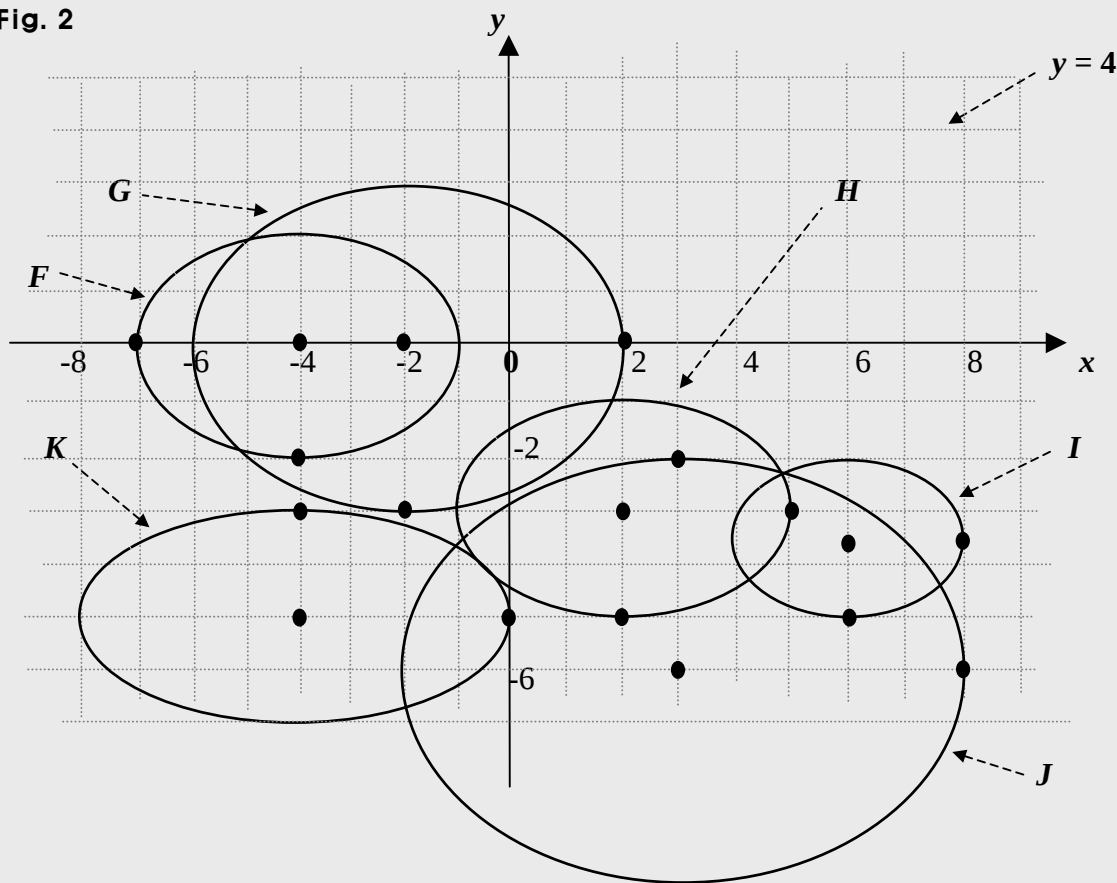
And next, looking at the ellipse **E**, we can see the center is $(7, \frac{5}{2})$, the major radius is $\frac{7}{2}$, and the minor radius is $\frac{3}{2}$. So we get $u = 7$, $v = \frac{5}{2}$, $a = \frac{7}{2}$, and $b = \frac{3}{2}$.

Thus, we get $\frac{(x-7)^2}{(\frac{7}{2})^2} + \frac{(y-\frac{5}{2})^2}{(\frac{3}{2})^2} = 1$, which is the equation of E , and can be put this way,

$$\text{too: } \frac{(x-7)^2}{\frac{49}{4}} + \frac{(y-\frac{5}{2})^2}{\frac{9}{4}} = 1, \frac{4(x-7)^2}{49} + \frac{4(y-\frac{5}{2})^2}{9} = 1 \text{ or } \frac{(x-7)^2}{49} + \frac{(y-\frac{5}{2})^2}{9} = \frac{1}{4}.$$

Next, moving on to the ellipses below, we can see that the ellipse F is centered at $(-4, 0)$, the major radius is 3, and the minor radius is 2.

Fig. 2



And if an ellipse is horizontal, 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 $a > b$, so a is the major radius, and b is the minor radius.

And thus, beginning with the ellipse F , we can see the center is $(-4, 0)$, the major radius is 3, and the minor radius is 2. So we get $u = -4$, $v = 0$, $a = 3$, and $b = 2$.

Thus, we get $\frac{\{x - (-4)\}^2}{3^2} + \frac{(y - 0)^2}{2^2} = 1 \Rightarrow \frac{(x + 4)^2}{3^2} + \frac{y^2}{2^2} = 1$, which is the equation of F ,

and can be put the way as follows, too: $\frac{(x + 4)^2}{9} + \frac{y^2}{4} = 1$, or $4(x + 4)^2 + 9y^2 = 36$.

Next, looking at the ellipse G , we can see the center is $(-2, 0)$, the major radius is 4, and the minor radius is 3. So we get $u = -2$, $v = 0$, $a = 4$, and $b = 3$.

Thus, we get $\frac{\{x - (-2)\}^2}{4^2} + \frac{(y - 0)^2}{3^2} = 1 \Rightarrow \frac{(x + 2)^2}{4^2} + \frac{y^2}{3^2} = 1$, which is the equation of G ,

and can be put this way, too: $\frac{(x + 2)^2}{16} + \frac{y^2}{9} = 1$, or this way: $9(x + 2)^2 + 16(y - 6)^2 = 144$.

Next, examining the ellipse H , we can see the center is $(2, -3)$, the major radius is 3, and the minor radius is 2. So we get $u = 2$, $v = -3$, $a = 3$, and $b = 2$.

Thus, we get $\frac{(x - 2)^2}{3^2} + \frac{\{y - (-3)\}^2}{2^2} = 1 \Rightarrow \frac{(x - 2)^2}{3^2} + \frac{(y + 3)^2}{2^2} = 1$, which is the equation

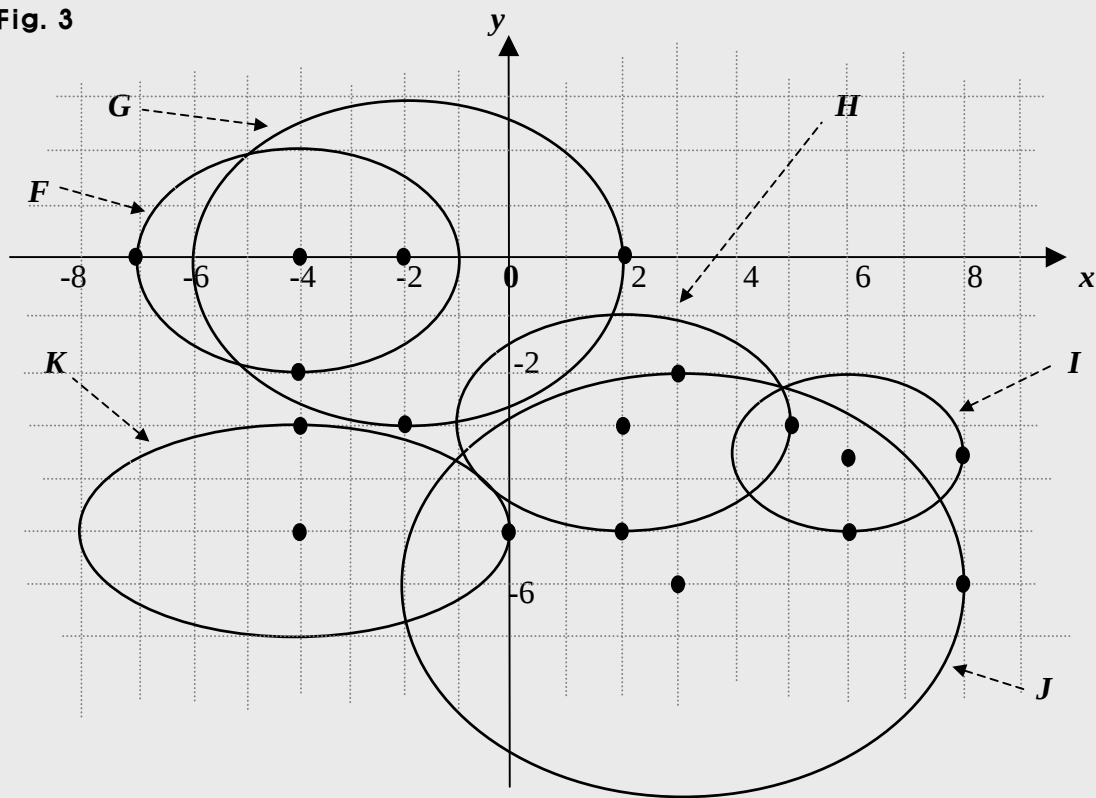
of H , and can be put this way, too: $\frac{(x - 2)^2}{9} + \frac{(y + 3)^2}{4} = 1$ or $4(x - 2)^2 + 9(y + 3)^2 = 36$.

Next, examining the ellipse I , we can see the center is $(6, \frac{7}{2})$, the major radius is 2, and the minor radius is $\frac{3}{2}$. So we get $u = 6$, $v = \frac{7}{2}$, $a = 2$, and $b = \frac{3}{2}$.

Thus, we get $\frac{(x - 6)^2}{2^2} + \frac{(y - \frac{7}{2})^2}{(\frac{3}{2})^2} = 1$, which is the equation of E , and can be put this way,

too: $\frac{(x - 6)^2}{4} + \frac{(y - \frac{7}{2})^2}{\frac{9}{4}} = 1$, $\frac{(x - 6)^2}{4} + \frac{4(y - \frac{7}{2})^2}{9} = 1$, or $9(x - 6)^2 + 16(y - \frac{7}{2})^2 = 36$.

Fig. 3



Next, examining the ellipse J , we can see the center is $(3, -6)$, the major radius is 5, and the minor radius is 4. So we get $u = 3$, $v = -6$, $a = 5$, and $b = 4$.

Thus, we get $\frac{(x-3)^2}{5^2} + \frac{\{y-(-6)\}^2}{4^2} = 1 \Rightarrow \frac{(x-3)^2}{5^2} + \frac{(y+6)^2}{4^2} = 1$, which is the ellipse J ,

and can be put this way, too: $\frac{(x-3)^2}{25} + \frac{(y+6)^2}{16} = 1$ or $16(x-3)^2 + 25(y+6)^2 = 400$.

Next, examining the ellipse K , we can see the center is $(-4, -5)$, the major radius is 4, and the minor radius is 2. So we get $u = -4$, $v = -5$, $a = 4$, and $b = 2$.

Thus, we get $\frac{\{x-(-4)\}^2}{4^2} + \frac{\{y-(-5)\}^2}{2^2} = 1 \Rightarrow \frac{(x+4)^2}{4^2} + \frac{(y+5)^2}{2^2} = 1$, which is the ellipse

K , and can be put this way, too: $\frac{(x+4)^2}{16} + \frac{(y+5)^2}{4} = 1$ or $4(x+4)^2 + 16(y+5)^2 = 64$.