3.3 - Day 2 - Ellipses

HW: p. 931: #'s 25 - 31 odds, 37 - 43 odds

EXAMPLE 3 Finding the Equation of an Ellipse from Its Foci and Vertices

Foci: (0,-3),(0,3) ; Vertices: (0,-6),(0,6)

$c=3$, $c^2=9$

$a=6$, $a^2=36$

$c^2=a^2-b^2$
$9=36-b^2$
$b^2=27$

$$\boxed{\frac{x^2}{27}+\frac{y^2}{36}=1}$$

major

Check Point 3 Find the standard form of the equation of an ellipse with foci at $(-2, 0)$ and $(2, 0)$ and vertices $(-3, 0)$ and $(3, 0)$.

foci: $c=2$, $c^2=4$

$a=3$, $a^2=9$

$$\boxed{\frac{x^2}{9}+\frac{y^2}{5}=1}$$

major

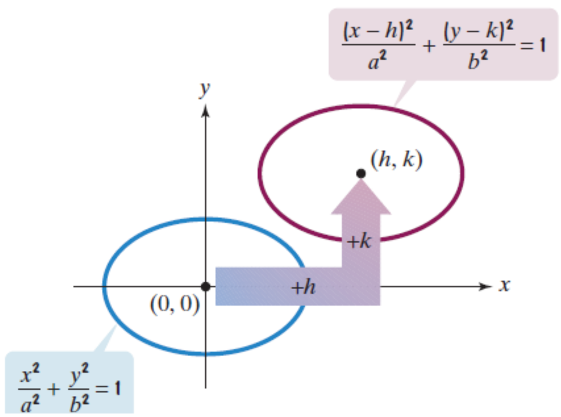
$c^2=a^2-b^2$
$4=9-b^2$
$b^2=5$

Translations of Ellipses

Horizontal and vertical translations can be used to graph ellipses that are not centered at the origin. **Figure 9.9** illustrates that the graphs of

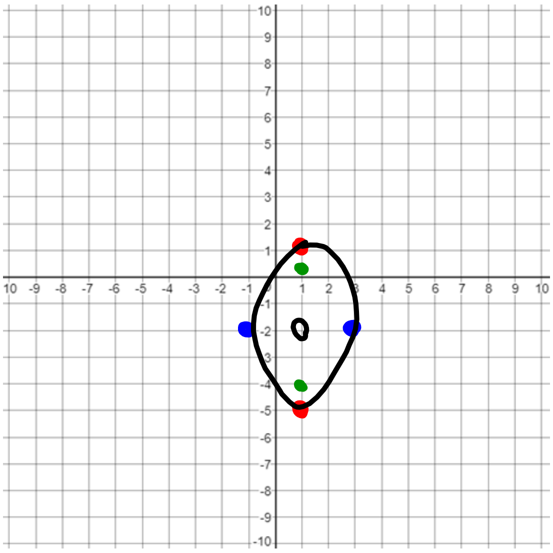
$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1 \quad \text{and} \quad \frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

have the same size and shape. However, the graph of the first equation is centered at (h, k) rather than at the origin.



EXAMPLE 4 Graphing an Ellipse Centered at (h, k)

Graph: $\frac{(x-1)^2}{4} + \frac{(y+2)^2}{9} = 1$. Where are the foci located?



center: $(1,-2)$

major (y): $a^2=9$, $a=3$

minor (x): $b^2=4$, $b=2$

$c^2=9-4$

$c^2=5$

$c \approx 2.2$

Foci:

$(1, 0.2)$

$(1, -4.2)$

$-2+2.2$

$-2-2.2$

Check Point Graph and find the foci.

$$\frac{(x+3)^2}{36} + \frac{(y-2)^2}{16} = 1$$

center: $(-3,2)$

major (x): $a^2=36$, $a=6$

minor (y): $b^2=16$, $b=4$

$c^2=36-16$

$c^2=20$

$c \approx 4.5$

Foci

$(1.5, 2)$

$(-7.5, 2)$