College Algebra CHS

Name Key

Ellipses ~~& Hyperbolas~~

Date

Identify the center, vertices, and foci of each. Then sketch the graph.

1) $\frac{x^2}{49} + (y+2)^2 = 1$ major

Center $(0,-2)$

$a=7 \quad b=1$

major vertices $(-7,-2)(7,-2)$

minor vertices: $(0,-1)(0,-3)$

foci: $(-4\sqrt{3},-2)(4\sqrt{3},-2)$

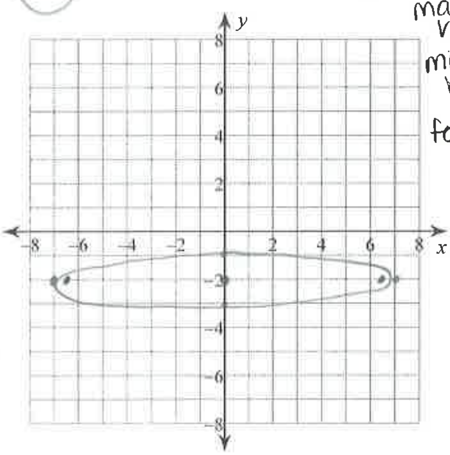
$a^2-c^2=b^2$

$7^2-c^2=1^2$

$49-c^2=1$

$48=c^2$

$c=4\sqrt{3}$



2) $\frac{(x-3)^2}{16} + (y-5)^2 = 1$ major

center $(3,5)$

$a=4 \quad b=1$

major vertices: $(-1,5)(7,5)$

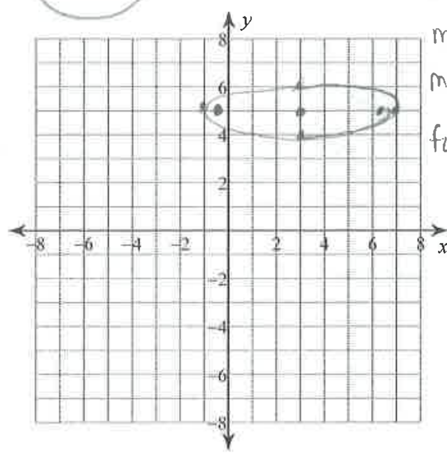
minor vertices: $(3,4)(3,6)$

foci: $(3-\sqrt{15},5)(3+\sqrt{15},5)$

$16-c^2=1$

$c^2=15$

$c=\sqrt{15}$



3) $\frac{(x-1)^2}{9} + \frac{(y-4)^2}{4} = 1$ major

Center $(1,4)$

$a=3 \quad b=2$

major: $(-2,4)(4,4)$

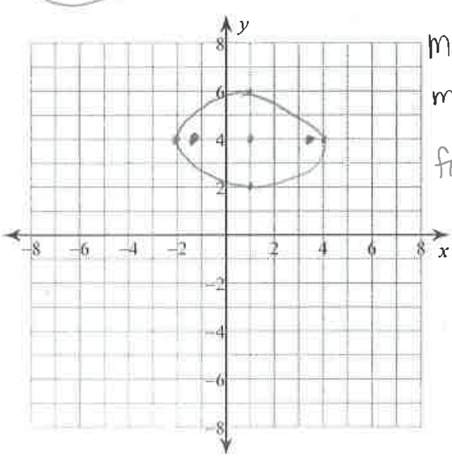
minor: $(1,2)(1,6)$

foci: $(1-\sqrt{5},4)(1+\sqrt{5},4)$

$9-c^2=4$

$c^2=5$

$c=\sqrt{5}$



4) $\frac{(x+1)^2}{15} + \frac{y^2}{35} = 1$ major

center $(-1,0)$

$a=\sqrt{35} \quad b=\sqrt{15}$

major $(-1,\sqrt{35})(-1,-\sqrt{35})$

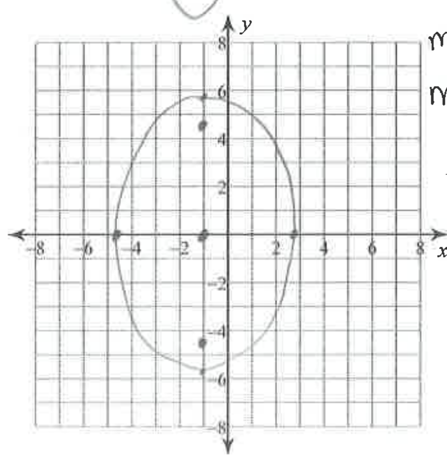
minor $(-1-\sqrt{15},0)(-1+\sqrt{15},0)$

foci: $(-1,2\sqrt{5})(-1,-2\sqrt{5})$

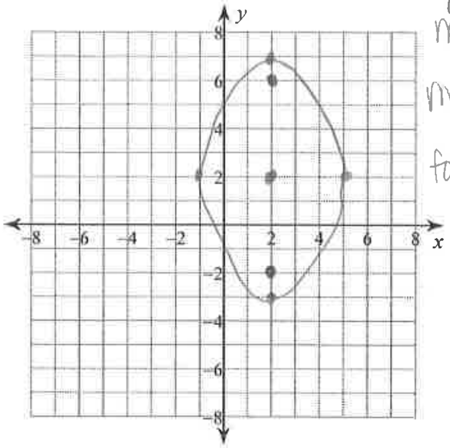
$35-c^2=15$

$c^2=20$

$c=2\sqrt{5}$

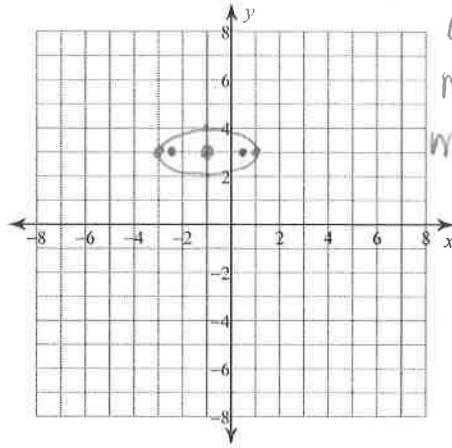


5) $\frac{(x-2)^2}{9} + \frac{(y-2)^2}{25} = 1$



center $(2,2)$
$a=5$ $b=3$
major: $(2,7)(2,-3)$
minor: $(-1,2)(5,2)$
foci: $(2,6)(2,-2)$
$25-c^2=9$
$c^2=16$
$c=4$

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



center $(-1,3)$
$a=2$ $b=1$
major: $(-3,3)(1,3)$
minor: $(-1,4)(-1,2)$
foci: $(-1-\sqrt{3},3)(-1+\sqrt{3},3)$
$4-c^2=1$
$c^2=3$
$c=\sqrt{3}$

Use the information provided to write the standard form equation of each ellipse.

7) $9x^2 + 16y^2 + 162x - 192y + 9 = 0$

$9(x^2+18x+81-81)+16(y^2-12y+36-36)+9=0$
$9(x+9)^2-729+16(y-6)^2-576+9=0$
$9(x+9)^2+16(y-6)^2=1296$
$\boxed{\frac{(x+9)^2}{144}+\frac{(y-6)^2}{81}=1}$

8) $16x^2 + 9y^2 + 224x - 108y - 188 = 0$

$16(x^2+14x+49-49)+9(y^2-12y+36-36)-188=0$
$16(x+7)^2-784+9(y-6)^2-324-188=0$
$16(x+7)^2+9(y-6)^2=1296$
$\boxed{\frac{(x+7)^2}{81}+\frac{(y-6)^2}{144}=1}$

9) $5x^2 + y^2 + 90x - 6y + 214 = 0$

$5(x^2+18x+81-81)+(y^2-6y+9-9)+214=0$
$5(x+9)^2-405+(y-3)^2-9+214=0$
$5(x+9)^2+(y-3)^2=200$
$\boxed{\frac{(x+9)^2}{40}+\frac{(y-3)^2}{200}=1}$

10) $x^2 + 3y^2 + 14x - 54y + 277 = 0$

$x^2+14x+49-49+3(y^2-18y+81-81)+277=0$
$(x+7)^2-49+3(y-9)^2-243+277=0$
$(x+7)^2+3(y-9)^2=15$
$\boxed{\frac{(x+7)^2}{15}+\frac{(y-9)^2}{5}=1}$

11) Vertices: $(0, -5)$, $(0, -15)$
Foci: $(0, -6)$, $(0, -14)$

$\boxed{\frac{x^2}{9}+\frac{(y+10)^2}{25}=1}$
major $= y$

$\left(\frac{0+0}{2}, \frac{-6+-14}{2}\right)$
center $(0,-10)$
$c=4$ $a=5$
$b^2=5^2-4^2$
$b^2=25-16$
$b^2=9$
$b=3$

12) Vertices: $(0, 16)$, $(0, -10)$
Foci: $(0, 15)$, $(0, -9)$

$\boxed{\frac{x^2}{25}+\frac{(y-3)^2}{169}=1}$
major $= y$

$\left(\frac{0+0}{2}, \frac{16-10}{2}\right)$
center $(0,3)$
$c=12$ $a=13$
$b^2=169-144$
$b^2=25$
$b=5$

13) Vertices: $(6, -4)$, $(-8, -4)$
Foci: $(-1+\sqrt{13}, -4)$, $(-1-\sqrt{13}, -4)$

$\left(\frac{6-8}{2}, \frac{-4-4}{2}\right)$
center $(-1,-4)$
$c=\sqrt{13}$ $a=7$
$b^2=49-13$
$b^2=36$
$b=6$
$\boxed{\frac{(x+1)^2}{49}+\frac{(y+4)^2}{36}=1}$
major $= x$

14) Vertices: $(6, 4)$, $(6, -20)$
Foci: $(6, -8+2\sqrt{11})$, $(6, -8-2\sqrt{11})$

$\left(\frac{6+6}{2}, \frac{4-20}{2}\right)$
center $(6,-8)$
$c=2\sqrt{11}$ $a=12$
$b^2=144-44$
$b^2=100$
$b=10$
$\boxed{\frac{(x-6)^2}{100}+\frac{(y+8)^2}{144}=1}$
major $= y$