Name______________________

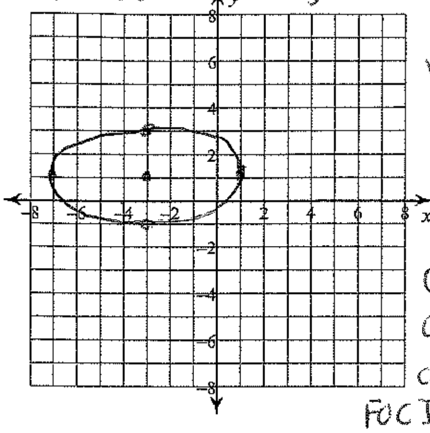
Ellipses

Date________________ Period____

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

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

Horizontal Major



center $(-3,1)$

$a=4$

$b=2$

Vert: $(1,1)$ $(-7,1)$

Covert: $(-3,3)$ $(-3,-1)$

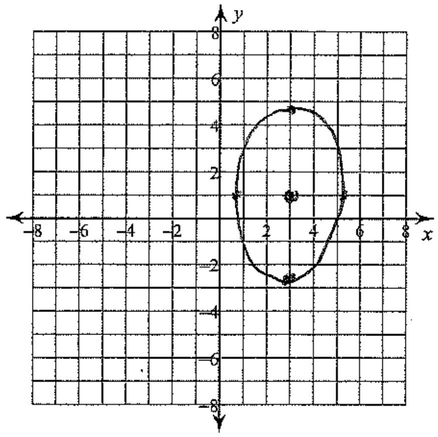
$c^2=a^2-b^2$

$c^2=16-4=12$

$c=\pm\sqrt{12}=\pm2\sqrt{3}$

FOCI: $(-3+2\sqrt{3},1)$ $(-3-2\sqrt{3},1)$

2) $\frac{(x-3)^2}{5}+\frac{(y-1)^2}{15}=1$



center: $(3,1)$

Vertical Major

$a=\sqrt{15}$

$b=\sqrt{5}$

Vertices: $(3,1+\sqrt{15})$ 4.87

$(3,1-\sqrt{15})$ -2.87

CoVertices: $(3+\sqrt{5},1)$ 5.23

$(3-\sqrt{5},1)$ .76

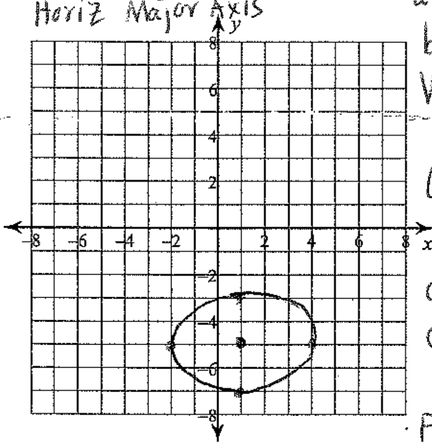
$c^2=15-5=10$

$c=\pm\sqrt{10}$

FOCI: $(3,1+\sqrt{10})$ $(3,1-\sqrt{10})$

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

Horiz Major Axis



center $(1,-5)$

$a=3$

$b=2$

Vert: $(4,-5)$ $(-2,-5)$

CoVert: $(1,-3)$ $(1,-7)$

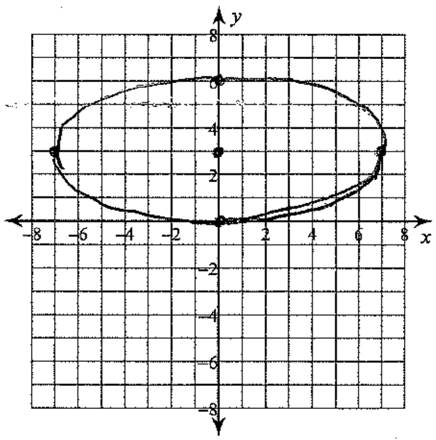
$c^2=a^2-b^2$

$c^2=9-4=5$

$c=\pm\sqrt{5}$

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

4) $\frac{x^2}{49}+\frac{(y-3)^2}{9}=1$



center: $(0,3)$

Horiz. Major Axis

$a=7$

$b=3$

Vertices: $(7,3)$ $(-7,3)$

CoVert: $(0,6)$ $(0,0)$

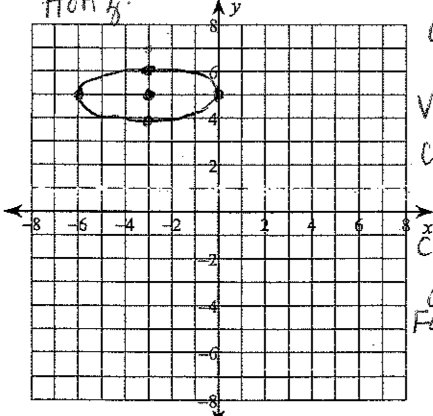
$c^2=49-9=40$

$c=\pm2\sqrt{10}$

FOCI: $(2\sqrt{10},3)$ $(-2\sqrt{10},3)$

5) $x^2+9y^2+6x-90y+225=0$

Horiz



center: $(-3,5)$

$a=3$

$b=1$

Vert: $(0,5)$ $(-6,5)$

co-vert: $(-3,6)$ $(-3,4)$

$c^2=9-1=8$

$c=\pm\sqrt{8}=\pm2\sqrt{2}$

FOCI: $(-3+2\sqrt{2},5)$ $(-3-2\sqrt{2},5)$

$x^2+6x+9+9y^2-90y=-225+9$

$(x+3)^2+9(y-5)^2=-225+9+225$

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

6) $9x^2+4y^2-36x+24y+36=0$

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

$\boxed{a=3, b=2}$

center: $(2,-3)$

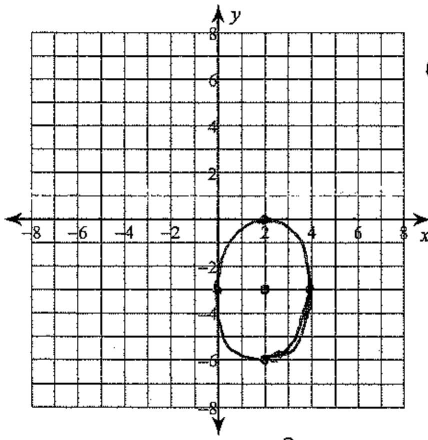
Vertical Major

Vertices: $(2,0)$ $(2,-6)$

CoVert: $(4,-3)$ $(0,-3)$

$c^2=9-4=5$ $c=\pm\sqrt{5}$

FOCI: $(2,-3+\sqrt{5})$ $(2,-3-\sqrt{5})$



$9x^2-36x+4y^2+24y=-36$

$9(x^2-4x+4)+4(y^2+6y+9)=-36+36+36$

$9(x-2)^2+4(y+3)^2=36$

Identify the center, vertices, co-vertices, foci, length of the major axis, length of the minor axis, ~~length of the latus rectum,~~ and eccentricity of each. $e = \frac{c}{a}$

7) $3x^2 + 35y^2 - 60x + 140y - 85 = 0$

$3x^2 - 60x \quad + 35y^2 + 140y \quad = 85$

$3(x^2 - 20x + 100) + 35(y^2 + 4y + 4) = 85 + 300 + 140$

$e = \frac{\sqrt{150}}{\sqrt{175}} = \frac{\sqrt{6}}{\sqrt{7}} \doteq .92$

$\frac{3(x-10)^2}{525} + \frac{35(y+2)^2}{525} = \frac{525}{525}$

$\boxed{c^2 = 175 - 15 = 150 \quad c = \sqrt{150} = 5\sqrt{6} \quad \text{FOCI}: (10 \pm 5\sqrt{6}, -2)}$

$\frac{(x-10)^2}{175} + \frac{(y+2)^2}{15} = 1$

Horiz. $a = \sqrt{175} = 5\sqrt{7}$ $\quad b = \sqrt{15}$ $\quad$ center $(10, -2)$

Vert: $(10 + 5\sqrt{7}, -2)$, $(10 - 5\sqrt{7}, -2)$ $\quad$ Co-Vert: $(10, -2+\sqrt{15})$, $(10, -2-\sqrt{15})$

length major: $10\sqrt{7}$ $\quad$ minor: $2\sqrt{15}$

8) $36x^2 + 5y^2 - 90y - 495 = 0$

$36x^2 \quad + 5y^2 - 90y \quad = 495$

$36x^2 \quad + 5(y^2 - 18y + 81) = 495 + 405$

$\frac{36x^2}{900} + \frac{5(y-9)^2}{900} = \frac{900}{900}$

$\frac{x^2}{25} + \frac{(y-9)^2}{180} = 1$

$e = \frac{\sqrt{155}}{\sqrt{180}} \doteq .93$

Center: $(0, 9)$

Vertical $\quad a = \sqrt{180} = 6\sqrt{5}$ $\quad b = 5$

Vertices: $(0, 9 + 6\sqrt{5})$, $(0, 9 - 6\sqrt{5})$ $\quad$ covert: $(5, 9)$, $(-5, 9)$ $\quad$ FOCI: $(0, 9 \pm \sqrt{155})$

$c^2 = 180 - 25 = 155 \quad c = \sqrt{155}$

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

9) Vertices: $(6, -6)$, $(-10, -6)$ $\quad$ major axis $= 16$ $\quad a = 8$

Foci: $(-2 + 2\sqrt{7}, -6)$, $(-2 - 2\sqrt{7}, -6)$ $\quad c = 2\sqrt{7}$ $\quad 4 \cdot 7$

$c^2 = a^2 - b^2 \quad b^2 = a^2 - c^2 = 64 - 28 = 36$

Center $(-2, -6)$

$\frac{(x+2)^2}{64} + \frac{(y+6)^2}{36} = 1$

10) Vertices: $(13, 9)$, $(-3, 9)$ $\quad$ major $= 16$ $\quad a = 8$

Foci: $(5 + 2\sqrt{7}, 9)$, $(5 - 2\sqrt{7}, 9)$ $\quad c = 2\sqrt{7}$

Center: $(5, 9)$

$c^2 = a^2 - b^2$, $\quad b^2 = a^2 - c^2$, $\quad b^2 = 64 - 28$, $\quad b^2 = 36$

$\frac{(x-5)^2}{64} + \frac{(y-9)^2}{36} = 1$

11) Vertices: $(5, 9)$, $(-13, 9)$ $\quad$ major axis $= 18$ $\quad a = 9$ (x)

Co-vertices: $(-4, 14)$, $(-4, 4)$ $\quad$ minor $= 10$ $\quad b = 5$ (y)

Center $(-4, 9)$

$\frac{(x+4)^2}{81} + \frac{(y-9)^2}{25} = 1$

12) Foci: $(3, 10 + \sqrt{105})$, $(3, 10 - \sqrt{105})$ $\quad c = \sqrt{105}$

Co-vertices: $(11, 10)$, $(-5, 10)$ $\quad$ minor axis length $\quad 2b = 16 \quad b = 8$ (w/ x)

Center $(3, 10)$

$c^2 = a^2 - b^2$, $\quad b^2 + c^2 = a^2$, $\quad 64 + 105 = a^2$, $\quad 169 = a^2$

$\frac{(x-3)^2}{64} + \frac{(y-10)^2}{169} = 1$

13) Foci: $\left(\frac{4\sqrt{35} + 7}{2}, \frac{3}{2}\right)$, $\left(\frac{-4\sqrt{35} + 7}{2}, \frac{3}{2}\right)$

Endpoints of minor axis: $\left(\frac{7}{2}, \frac{7}{2}\right)$, $\left(\frac{7}{2}, -\frac{1}{2}\right)$

Center $\left(\frac{7}{2}, \frac{3}{2}\right)$ $\quad c = 2\sqrt{35}$ $\quad b = 2$

$c^2 + b^2 = a^2$

$140 + 4 = a^2$

$144 = a^2$

$\frac{(x - \frac{7}{2})^2}{144} + \frac{(y - \frac{3}{2})^2}{4} = 1$

14) Center: $(-8, 5)$ $\quad a = 10$ (w/ y's)

Vertex: $(-8, 15)$

Focus: $(-8, 5 + \sqrt{51})$ $\quad c = \sqrt{51}$

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

$b^2 = 100 - 51 = 49$

$\frac{(x+8)^2}{49} + \frac{(y-5)^2}{100} = 1$

15) Endpoints of major axis:

$(-4, -6)$, $(-16, -6)$ $\quad$ major $= 12$ $\quad a = 6$

Endpoints of minor axis:

$(-10, -2)$, $(-10, -10)$ $\quad$ minor $= 8$ $\quad b = 4$

Center $(-10, -6)$

$\frac{(x+10)^2}{36} + \frac{(y+6)^2}{16} = 1$

16) Eccentricity $= \frac{\sqrt{15}}{4} = \frac{c}{a}$ $\quad \frac{\sqrt{15}}{4} a = c$ $\quad b = 3$

Center: $(-5, 5)$

Co-vertex: $(-8, 5)$

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

$\left(\frac{\sqrt{15}}{4} a\right)^2 = a^2 - 9$

$\frac{15}{16} a^2 = a^2 - 9$

$9 = \frac{1}{16} a^2$

$144 = a^2$ (w/ y's)

$\boxed{\frac{(x+5)^2}{9} + \frac{(y-5)^2}{144} = 1}$