Conics Unit
Review

Name KEY
Date _____ Period ___

Directions for #1-8: Find the standard form of the following equation. Identify the conic.

For **Circles**: find the center, radius, then graph.
For **Ellipses:** find the center, vertices, co-vertices, foci, then graph.
For **Hyperbolas:** find the center, vertices, co-vertices, foci, asymptotes, then graph.
For **Parabolas**: find the vertex, focus, directrix, axis of symmetry, then graph.

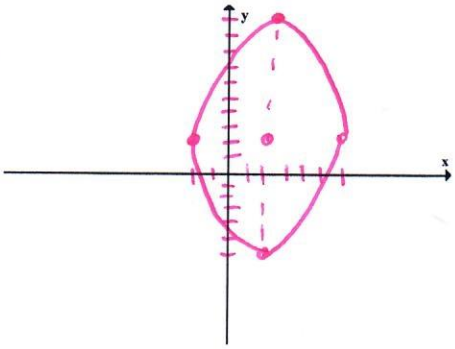
1) $\frac{(x-2)^2}{16}+\frac{(y-2)^2}{64}=1$

a^2 is bigger!

$a^2=64$ $b^2=16$
$a=8$ $b=4$

$c^2=a^2-b^2$
$=64-16$
$=48$
$c=\sqrt{48}=4\sqrt{3}$
16 3

Ellipse (vert)
center: (2,2)
vertices: (2,10) and (2,-6)
covertices: (-4,2) and (6,2)
foci: $(2, 2\pm4\sqrt{3})$



foci are along major axis!

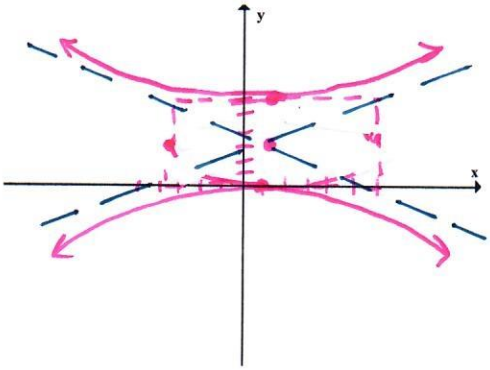
2) $\frac{(y-3)^2}{9}-\frac{(x-1)^2}{25}=1$

y is first

$a^2=9$ $b^2=25$
$a=3$ $b=5$
vert. hz.

$c^2=a^2+b^2$
$c^2=9+25$
$c^2=34$
$c=\sqrt{34}$

Hyperbola (vertical)
center: (1,3)
vertices: (1,0) and (1,6)
covertices: (6,3) and (-4,3)
foci: $(1, 3\pm\sqrt{34})$
asymptotes: $\pm 3/5$

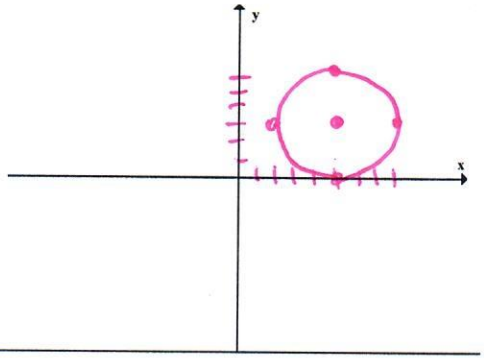


3) $x^2+y^2-10x-6y+25=0$

$(x^2-10x+25)+(y^2-6y+9)=-25$
$(-\frac{10}{2})=(-5)^2$ $(-\frac{6}{2})^2=(-3)^2$ $+25$ $+9$

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

CIRCLE center: (5,3)
radius: $\sqrt{9}=3$



4) $16x^2+y^2-32x+4y-44=0$

$16(x^2-2x+1)+(y^2+4y+4)=44$
$+16(1)$ $+4$

$\frac{16(x-1)^2}{64}+\frac{(y+2)^2}{64}=\frac{64}{64}$

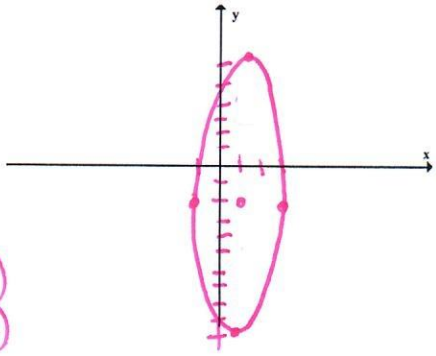
$\frac{(x-1)^2}{4}+\frac{(y+2)^2}{64}=1$

$a^2=64$ $b^2=4$
$a=8$ $b=2$

$c^2=64-4$
$c=\sqrt{60}=4\sqrt{15}$

ELLIPSE (vertical)

center: (1,-2)
vertices: (1,6) and (1,-10)
covertices: (-1,-2) and (3,-2)
foci: $(1, -2\pm4\sqrt{15})$

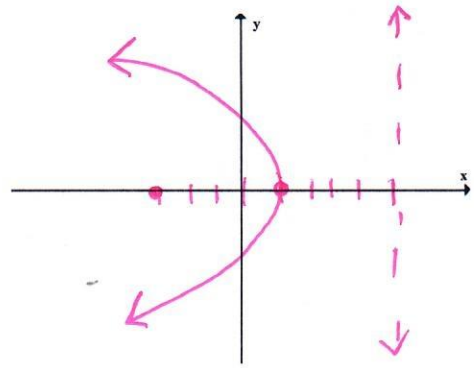


5) $y^2 = -16(x-1)$

PARABOLA (opens left)

$4p = -16$
$p = -4$

vertex: $(1,0)$
focus: $(-3,0)$
directrix: $x = 5$
Axis of Sym: $y = 0$



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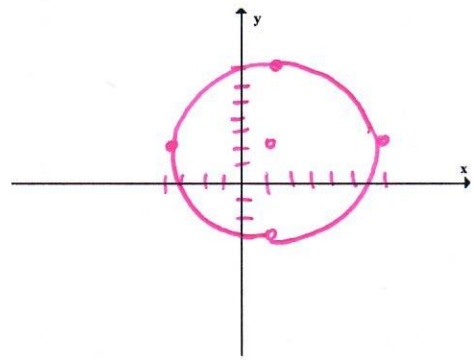
6) $x^2 + y^2 - 2x - 4y - 20 = 0$

$(x^2 - 2x + 1) + (y^2 - 4y + 4) = 20 + 1 + 4$

$(x-1)^2 + (y-2)^2 = 25$

CIRCLE

center: $(1,2)$
radius: $\sqrt{25} = 5$



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7) $y^2 + 4y + 4x - 8 = 0$

$(y^2 + 4y + 4) = -4x + 8 + 4$

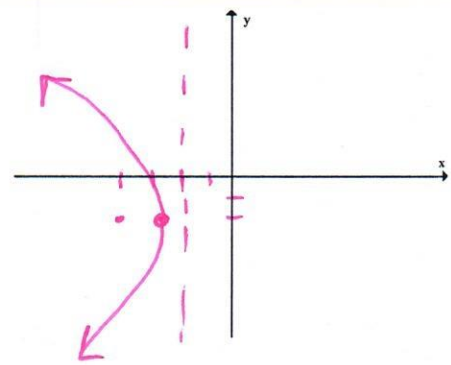
$(y+2)^2 = -4(x+3)$

$+4p = -4$
$p = -1$

PARABOLA (opens left)

vertex: $(-3,-2)$ directrix: $x = -2$

focus: $(-4,-2)$ Axis of Sym: $y = -2$



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8) $-4x^2 + 16y^2 + 16x - 80 = 0$

$-4(x^2 - 4x + 4) + 16y^2 = 80 + 4(-4)$

$\frac{-4(x-2)^2}{64} + \frac{16y^2}{64} = \frac{64}{64}$

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

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

$a^2 = 4$ $b^2 = 16$
$a = 2$ $b = 4$
$c^2 = 20$
$c = 2\sqrt{5}$

HYPERBOLA (vert)

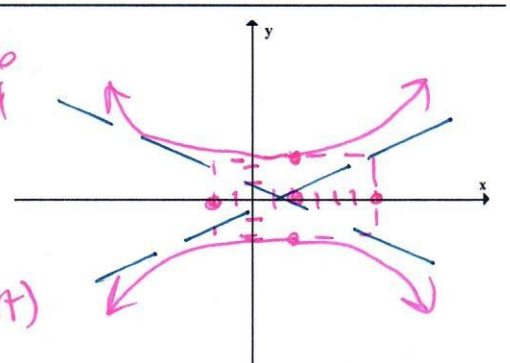
center: $(2,0)$

vertices: $(2,2)$ and $(2,-2)$

covertices: $(6,0)$ and $(-2,0)$

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

asymptotes: $\pm 2/4 = \pm 1/2$

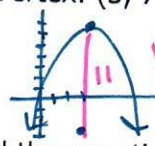


PARABOLA OPENS AROUND FOCUS & AWAY FROM DIRECTRIX

Find the equations for the following parabolas:

9) Focus: (3, -4)
Vertex: (3, 7)

$p=-11$ $(x-3)^2=4(-11)(y-7)$

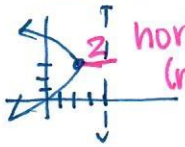


vertical (negative p)

$\boxed{(x-3)^2=-44(y-7)}$

10) Vertex: (2, 3)
Directrix: x = 4

$p=-2$ $(y-3)^2=4(-2)(x-2)$

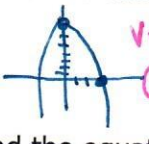


horizontal (neg. p)

$\boxed{(y-3)^2=-8(x-2)}$

Find the equations for the following ellipses:

11) Vertex: (0,7) $a=7$
Co-Vertex: (3,0) $b=3$

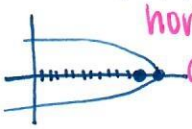


vertical
center (0,0)

$\boxed{\frac{x^2}{9}+\frac{y^2}{49}=1}$

12) Focus (12,0) $a=13$
Vertex (13,0) $c=12$

$c^2=a^2-b^2$ $b^2=25$
$144=169-b^2$

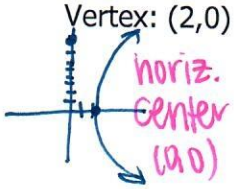


horizontal
center (0,0)

$\boxed{\frac{x^2}{169}+\frac{y^2}{25}=1}$

Find the equations for the following hyperbolas:

13) Co-Vertex: (0,8)
Vertex: (2,0)

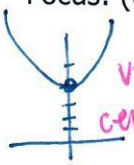


horiz.
center
(2,0)

$\boxed{\frac{x^2}{4}-\frac{y^2}{64}=1}$

14) Vertex: (0,4) $a=4$
Focus: (0,5) $c=5$

$c^2=a^2+b^2$
$25=16+b^2$
$9=b^2$

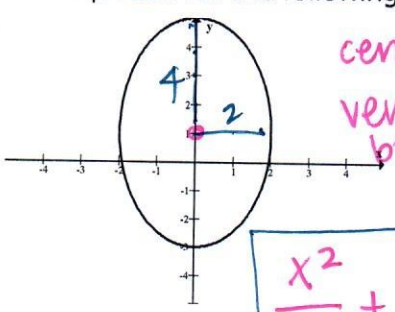


vert.
center (0,0)

$\boxed{\frac{y^2}{16}-\frac{x^2}{9}=1}$

Find the equation for the following graphs.

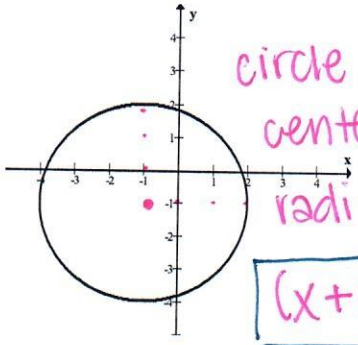
15)



center (0,1)
vertical → bigger under y

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

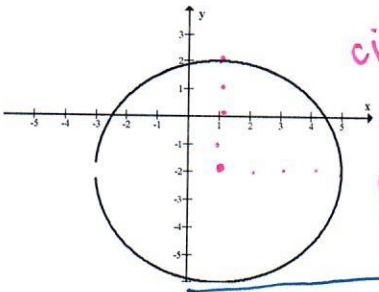
16)



circle
center (-1,-1)
radius 3

$\boxed{(x+1)^2+(y+1)^2=9}$

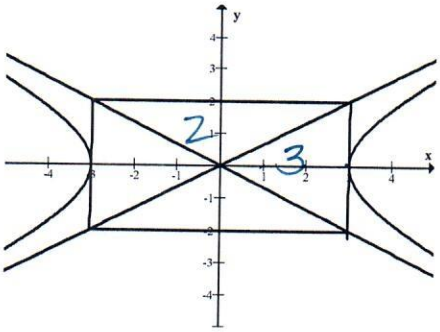
17)



circle
center (1,-2)
radius 4

$\boxed{(x-1)^2+(y+2)^2=16}$

18)



hyperbola
horiz. → x first
center (0,0)

$\boxed{\frac{x^2}{9}-\frac{y^2}{4}=1}$

Classify the following as Circles, Ellipses, Hyperbolas, or Parabolas.

19) $x^2-y^2+2x-4y-6=0$
HYPERBOLA

20) $2x^2+2y^2-8=0$
CIRCLE

21) $5x^2+4y^2+5x-8y-6=0$
ELLIPSE

22) $3x^2-3y^2-12=0$
HYPERBOLA

23) $-x^2-3y^2-12x=0$
ELLIPSE

24) $y^2+4y-x=0$
PARABOLA