Pre-Calculus
Conics: Parabolas, Circles, Ellipses, Hyperbolas

Name_____
Date_____ Period____

Find the vertex, focus, and directrix of the parabola and sketch its graph.

1.) $y^2+6y+8x+25=0$

$y^2+6y+\underline{9} = -8x-25$

$(y+3)^2 = -8x-25+9$ (−16)

$(y+3)^2 = -8(x+2)$

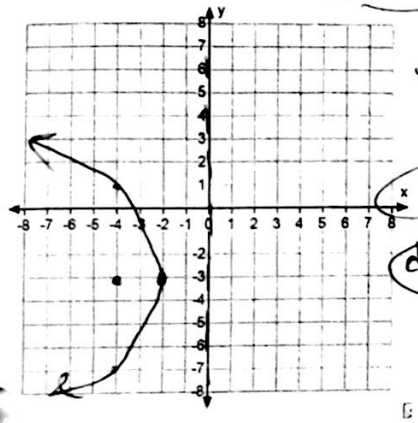
V(−2, −3)

$4p=-8$

$p=-2$

F(−4, −3)

d: x=0



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

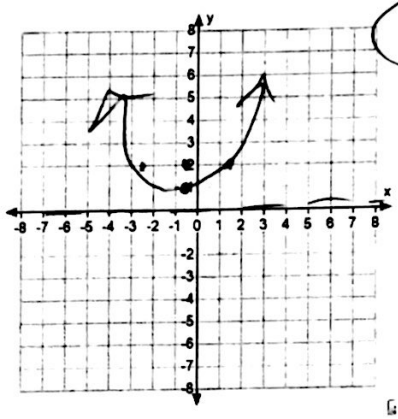
$V\left(-\frac{1}{2}, 1\right)$

$4p=4$

$p=1$

$F\left(-\frac{1}{2}, 2\right)$

$y=0$



Find the standard form of the equation of the parabola with the given characteristics.

3.) Vertex: (-1, 2); Focus (-1, 0)

$(x+1)^2 = -8(y-2)$

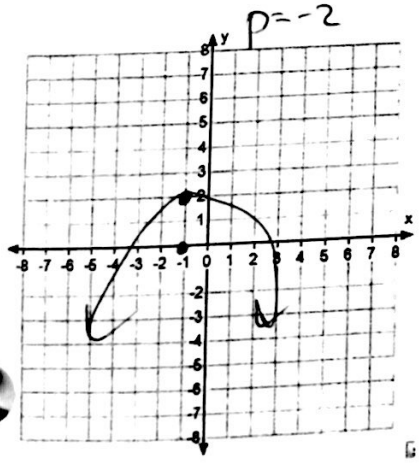
4.) Vertex: (0, 4); Directrix: y = 2

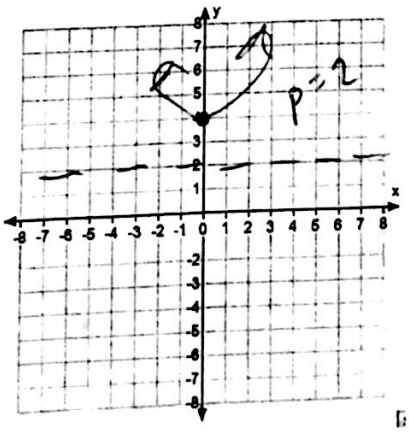
$x^2 = 8(y-4)$

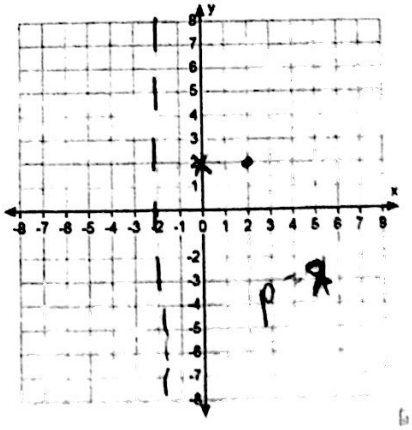
5.) Focus: (2, 2); Directrix: x = -2

~~$(y-2)^2 = 16(x-0)$~~

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







Identify the conic as a circle or ellipse. Then find the center, radius, vertices, foci, and sketch its graph. (Center and radius only if a circle)

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

$9(x^2+4x+\underline{4}) + 4(y^2-6y+9) = -36 + 36 + 36$

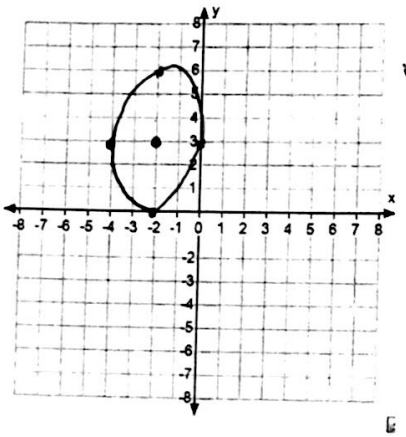
$9(x+2)^2 + 4(y-3)^2 = 36$

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

$C(-2,3)$

$V(-2,0)\ (-2,6)$

$F: (-2, 3 \pm \sqrt{5})$

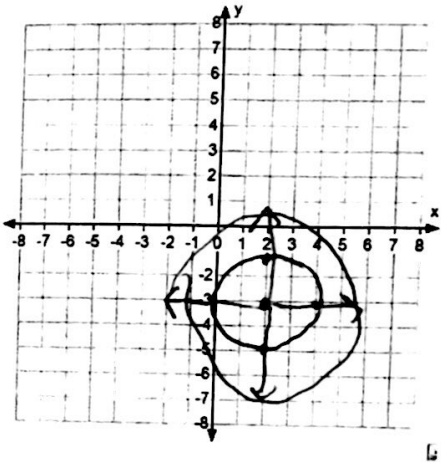


7.) $x^2 + y^2 - 4x + 6y - 3 = 0$

$x^2-4x+4 + y^2+6y+9 = 3+13$

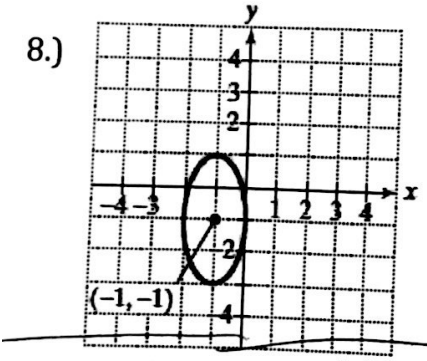
$$(x-2)^2 + (y+3)^2 = 16$$

$C(2,-3)\quad r=4$



Find the standard form of the equation of the ellipse with the given characteristics.

8.)



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

9.) Vertices $(\pm 6, 0)$; Foci: $(\pm 2, 0)$

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

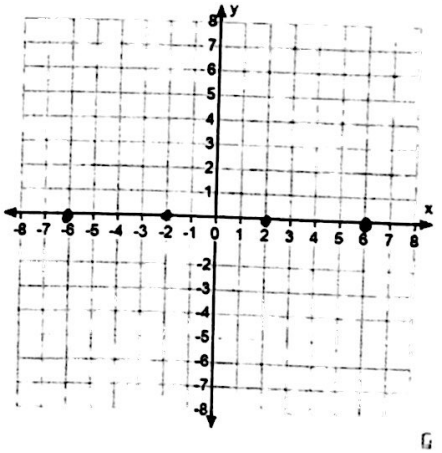
$36 - b^2 = 4$

$b^2 = 32$

$c = 2$

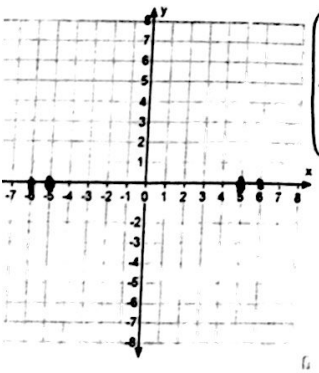
$a = 6$

$$\frac{x^2}{36} + \frac{y^2}{32} = 1$$



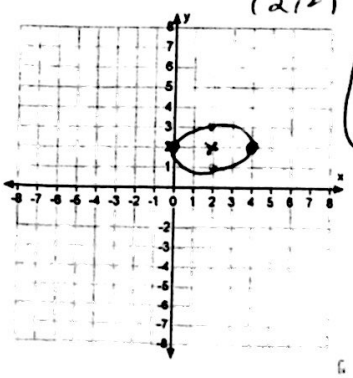
10.) Foci $(\pm 5, 0)$; Major Axis Length is 12

$36 - 5^2 = 25 \quad b^2 = 11$



$$\frac{x^2}{36} + \frac{y^2}{11} = 1$$

11.) Vertices (0, 2) and (4, 2);
endpoints of the minor axis are (2, 3) and (2, 1)



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

Find the center, vertices, foci, and the equations of the asymptotes of the hyperbola, and then sketch its graph.

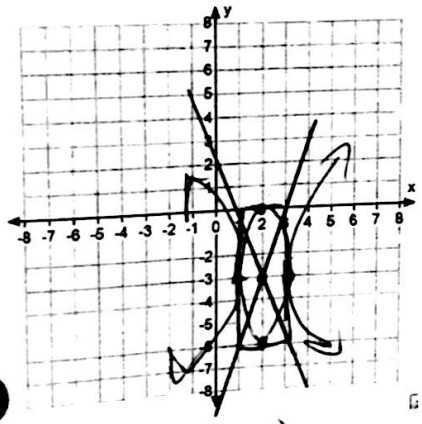
12.) $9x^2 - y^2 - 36x - 6y + 18 = 0$

$9(x^2 - 4x + 4) - (y^2 + 6y + 9) = -18$

$9(x-2)^2 - (y+3)^2 = -18 + 36 - 9$

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

$C(2, -3)$ $V(3, -3)$ $(1, -3)$



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

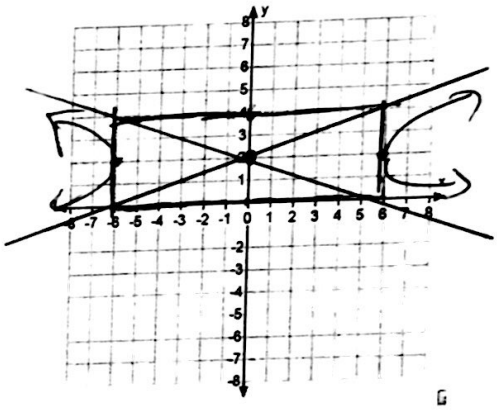
13.) $x^2 - 9y^2 + 36y - 72 = 0$

$x^2 - 9(y^2 - 4y + 4) = 72$

$x^2 - 9(y-2)^2 = 72 - 36$

$x^2 - 9(y-2)^2 = 36$

$\frac{x^2}{36} - \frac{(y-2)^2}{4} = 1$



$C(0, 2)$

$V(6, 2)$

$(-6, 2)$

Find the standard form of the equations of the hyperbola with the given characteristics and center at the origin.

14.) Vertices $(0, \pm 2)$; Foci: $(0, \pm 4)$

$a^2 = 2$

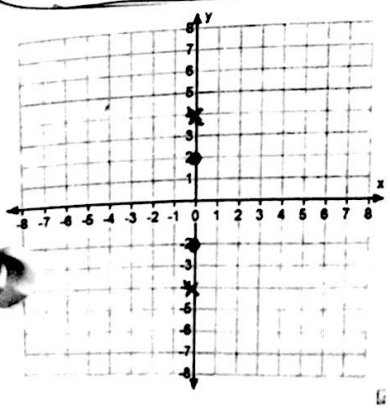
$c = 4$

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

$4 + b^2 = 16$

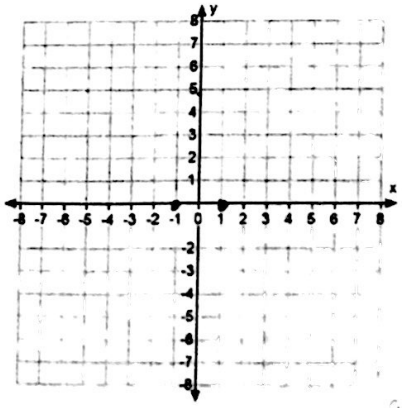
$b^2 = 12$

$\frac{y^2}{4} - \frac{x^2}{12} = 1$



15.) Vertices ~~$(\pm 1, 0)$~~; Asymptotes: ~~$y = \pm 5x$~~

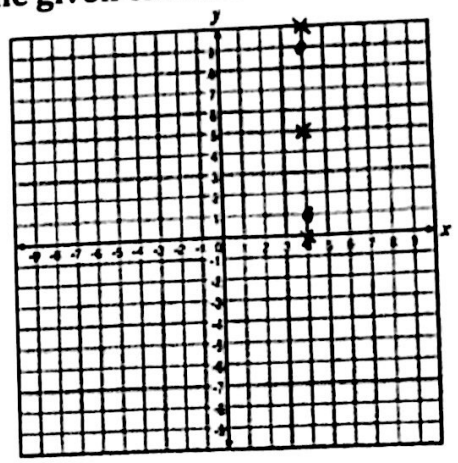
$\frac{x^2}{1} - \frac{y^2}{25} = 1$



$a^2+b^2=c^2$ $16+5=25$

Find the standard form of the equations of the hyperbola with the given characteristics.

16.) Vertices $(4,1)$ and $(4,9)$; Foci $(4,0)$ and $(4,10)$



C(4,5)

$$\frac{(y-5)^2}{16} - \frac{(x-4)^2}{9} = 1$$

Write the equation in standard form and then classify the graph as a parabola, circle, ellipse, or hyperbola.

17.) $x^2+y^2-6x+4y+9=0$

Circle

$x^2-6x+9+y^2+4y+4 = -9+9+4$

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

18.) $x^2+4y^2-6x+16y+21=0$

Ellipse

$x^2-6x+9 + 4(y^2+4y+4) = -21+9+16$

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

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

19.) $4x^2-y^2-4x-3=0$

Hyperbola

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

$4(x-1/2)^2 - y^2 = 4$

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

20.) $y^2-6y-4x+21=0$

Parabola

$y^2-6y+9 = 4x-21+9$ (4x−12)

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