SM2H

5.5 Circles

Name________________________________

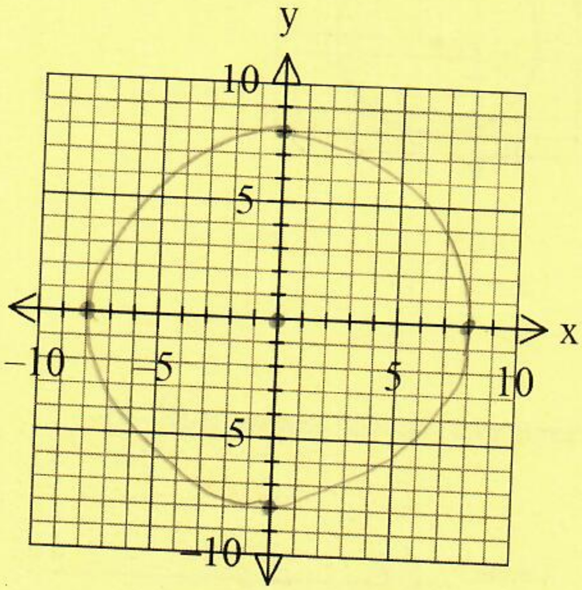
Date____________________ Period__________

Given the standard form of a circle, identify the center and the radius of each circle. Then graph the circle.

1. $x^2 + y^2 = 64$

center: (0,0)

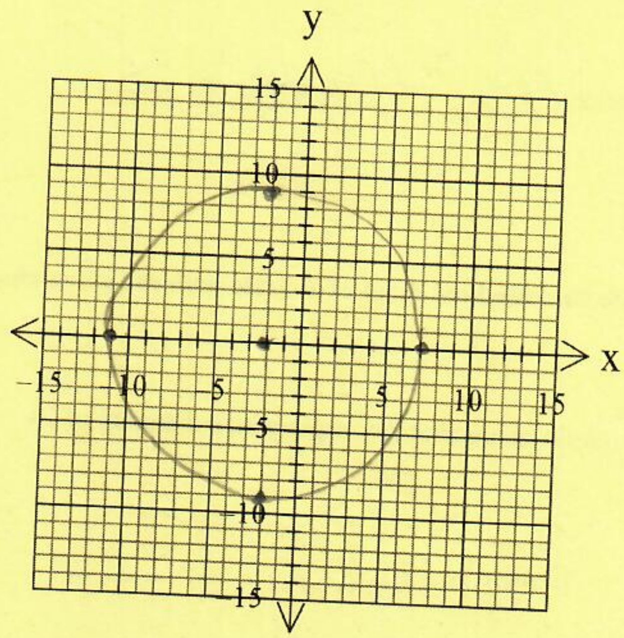
radius: 8



2. $(x+2)^2 + y^2 = 81$

center: (−2,0)

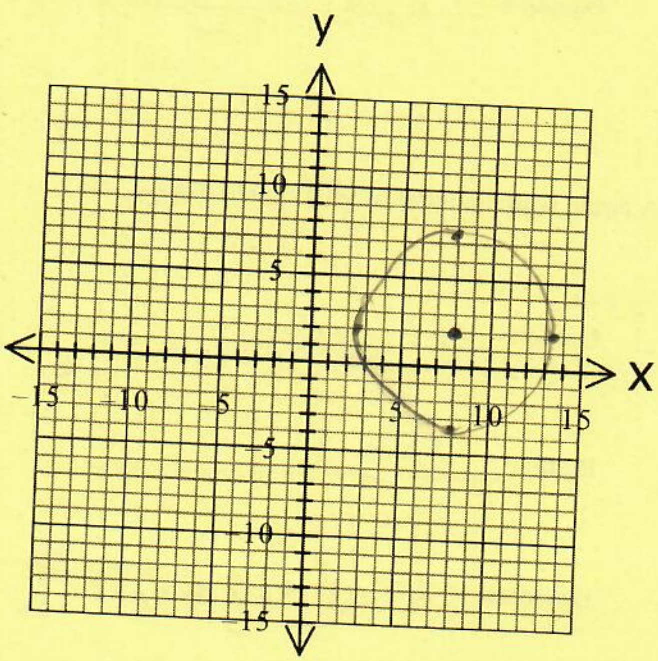
radius: 9



3. $(x-8)^2 + (y-2)^2 = 32$

center: (8,2)

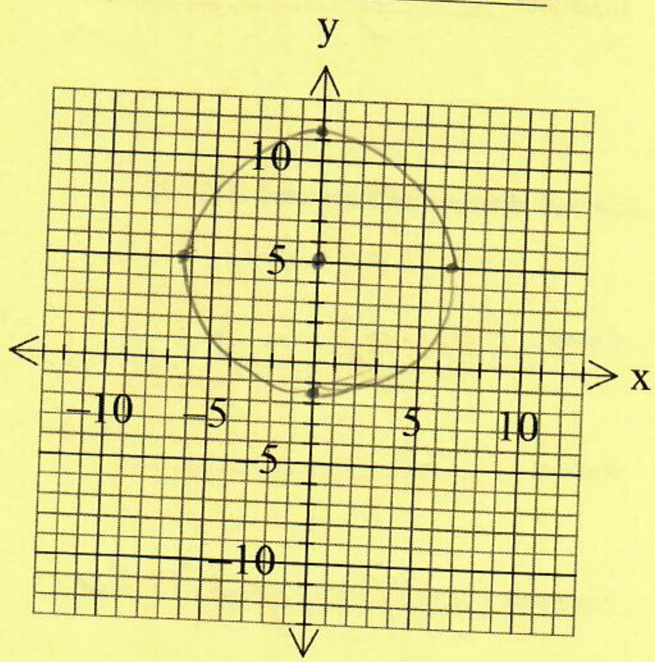
radius: $\sqrt{32} = 4\sqrt{2} = 5.66$



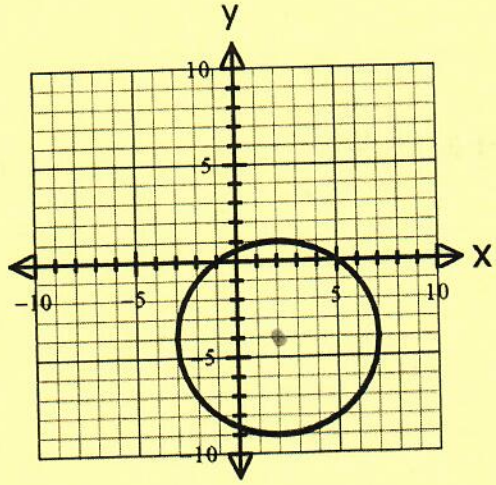
4. $x^2 + (y-5)^2 = 40$

center: (0,5)

radius: $\sqrt{40} = 2\sqrt{10} = 6.32$



5. Write the standard form of the equation for the circle.



Center: $(2, -4)$

Radius: 5

Equation: $(x-2)^2+(y+4)^2=25$

Write the standard form of a circle with the given characteristics.

6. A circle centered at the origin with a diameter of 14.

Center: $(0, 0)$

Radius: 7

Equation: $x^2+y^2=49$

7. A circle with radius 10 centered at $(8, -6)$

Center: $(8, -6)$

Radius: 10

Equation: $(x-8)^2+(y+6)^2=100$

8. A circle with diameter of 8 centered at (3, -2)

Center: $(3, -2)$

Radius: 4

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

9. A circle with diameter of $\sqrt{10}$ centered at (-2, -7)

Center: $(-2, -7)$

Radius: $\frac{\sqrt{10}}{2}$

Equation: $(x+2)^2+(y+7)^2=\frac{5}{2}$

Find the midpoint.

10. $P_1 = (3, -6)\ and\ P_2 = (-7, 8)$

$\left(\frac{3+-7}{2}, \frac{-6+8}{2}\right) = \left(\frac{-4}{2}, \frac{2}{2}\right)$

$= (-2, 1)$

11. $P_1 = (10, 15)\ and\ P_2 = (-8, 3)$

$\left(\frac{10+-8}{2}, \frac{15+3}{2}\right) = \left(\frac{2}{2}, \frac{18}{2}\right)$

$= (1, 9)$

Find the distance between the two points.

12. $P_1 = (3, -6)\ and\ P_2 = (-7, 8)$

$\sqrt{(-7-3)^2 + (8--6)^2}$

$= \sqrt{100+196} = \sqrt{296}$

$= 17.20$

13. $P_1 = (3, -6)\ and\ P_2 = (-7, 8)$

$\sqrt{(-7-3)^2 + (8--6)^2}$

$= \sqrt{100+196} = \sqrt{296}$

$= 17.20$

Write the standard form of a circle with the given characteristics. (hint: draw a picture of the circle)

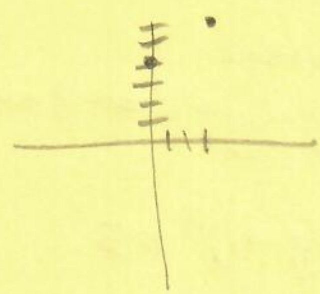
14. A circle with center at (0, 4) and a point on the circle at (3, 6)

Center: $(0, 4)$

$\sqrt{(3-0)^2 + (6-4)^2} = \sqrt{9+4}$

Radius: $= \sqrt{13}$

Equation: $x^2 + (y-4)^2 = 13$

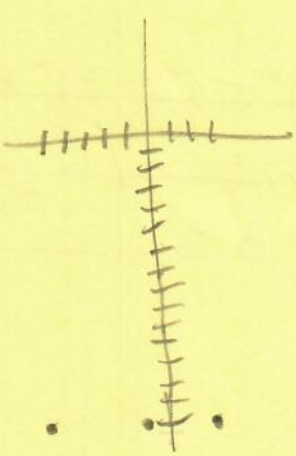


15. A circle with diameter endpoints at $(3, -15)$ and (-5, -15)

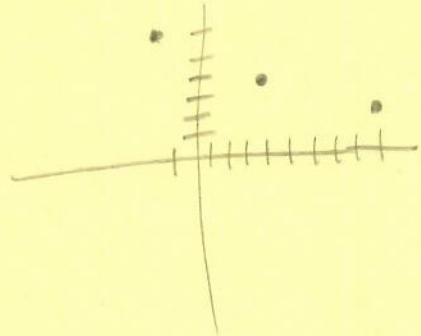
Center: $(-1, -15)$

Radius: 4

Equation: $(x+1)^2 + (y+15)^2 = 16$



16. A circle with diameter endpoints at $(9,2)$ and $(-1,6)$



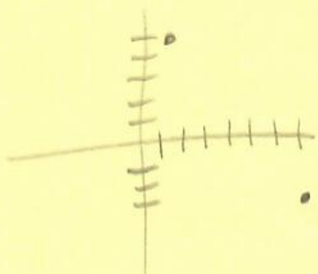
Center: $\left(\frac{9+-1}{2}, \frac{2+6}{2}\right) = \left(\frac{8}{2}, \frac{8}{2}\right) = (4,4)$

$\sqrt{(4-9)^2+(4-2)^2} = \sqrt{25+4}$

Radius: $\sqrt{29}$

Equation: $(x-4)^2+(y-4)^2=29$

17. A circle with center at (7, -3) and a point on the circle at (1, 5)



Center: $(7,-3)$

$\sqrt{(1-7)^2+(5--3)^2} = \sqrt{36+64}$

Radius: $=\sqrt{100} = 10$

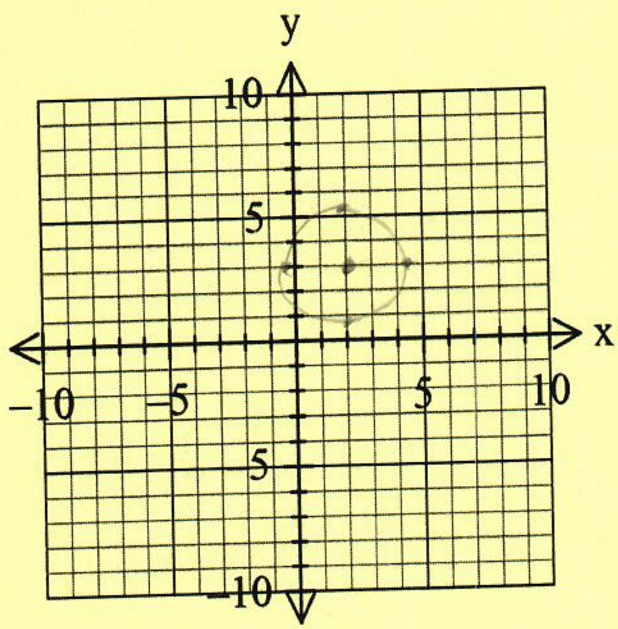
Equation: $(x-7)^2+(y+3)^2=100$

Complete the square to rewrite the equation in standard form. Find the center and the radius of a circle given by each equation and then draw the graph.

18. $x^2+y^2-4x-6y+8=0$

$\underbrace{x^2-4x+4}_{-2} + \underbrace{y^2-6y+9}_{-3} = -8+4+9$

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



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

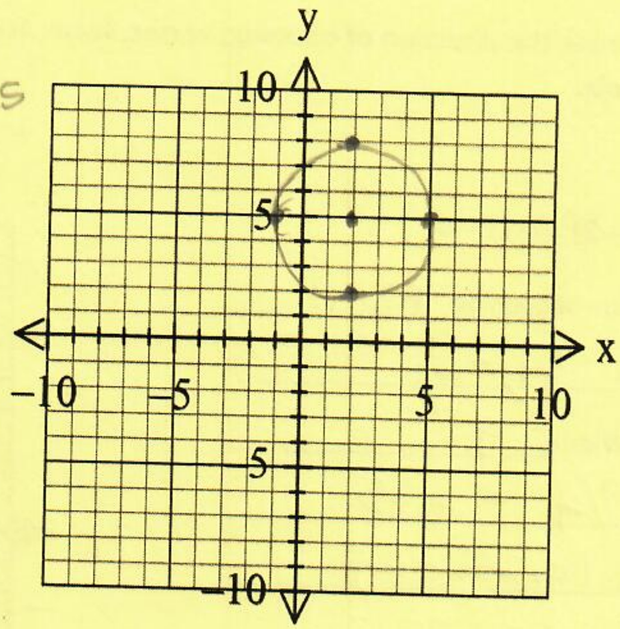
Center: $(2,3)$

Radius: $\sqrt{5} = 2.24$

19. $x^2 + y^2 - 4x + 10y + 20 = 0$

$x^2 - 4x + 4 + y^2 - 10y + 25 = -20 + 4 + 25$

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



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

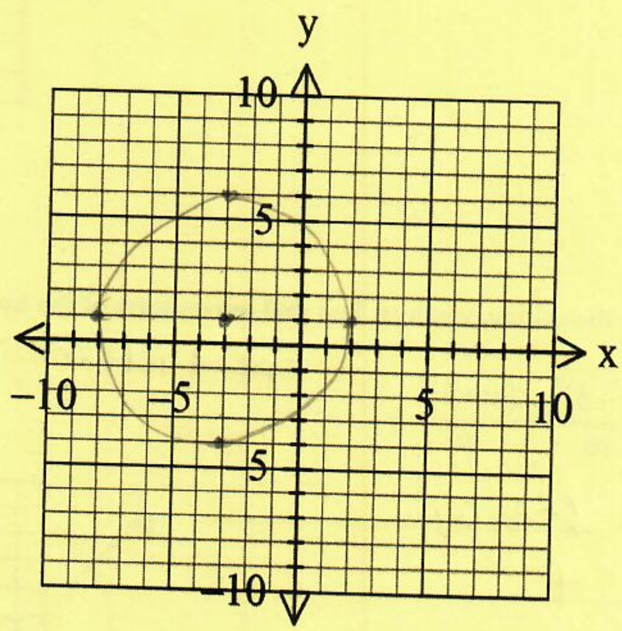
Center: $(2, 5)$

Radius: 3

20. $x^2 + y^2 + 6x - 2y - 15 = 0$

$x^2 + 6x + 9 + y^2 - 2y + 1 = 15 + 9 + 1$

$(x+3)^2 + (y-1)^2 = 25$



Equation: $(x+3)^2 + (y-1)^2 = 25$

Center: $(-3, 1)$

Radius: 5

Review

21. **Identify each equation as a parabola, hyperbola, ellipse or circle.**

a. $(y-9) = 8(x-7)^2$

parabola

b. $(x+2)^2 + (y-3)^2 = 1$

circle

c. $\frac{9(y-7)^2}{36} - \frac{4(x-9)^2}{36} = \frac{36}{36}$

hyperbola

d. $\frac{x^2}{25} + \frac{(y-8)^2}{3} = 1$

ellipse

e. $x = 3y^2 + 15$

parabola

f. $x^2 + y^2 = 4$

circle

Determine the direction of opening, vertex, focus, focal width, the value of a, and directrix, then graph the parabola.

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

Direction of opening: right

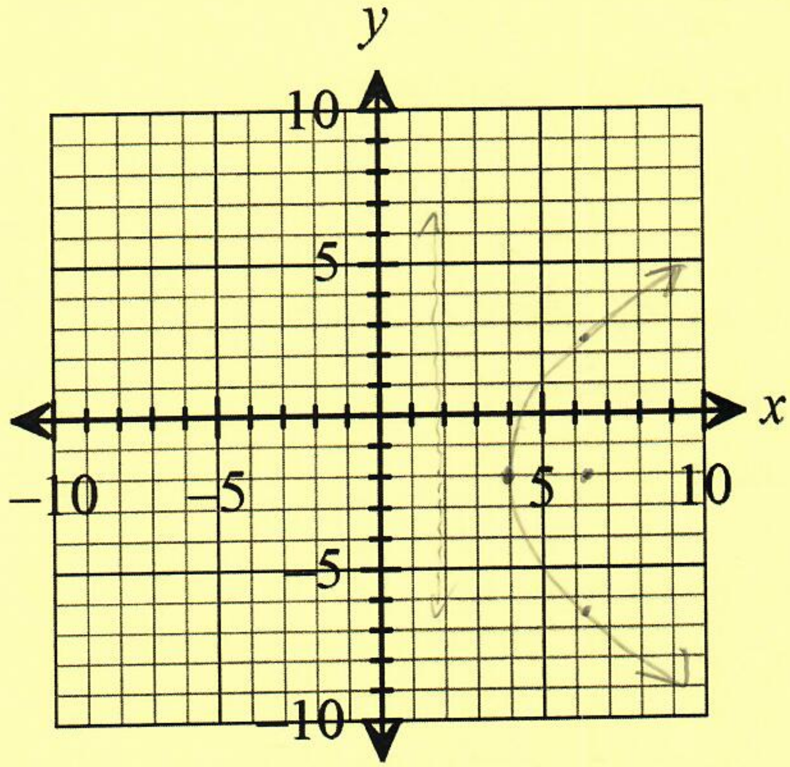
Vertex: (4, -2)

Focal Width: 9

a= 9/4 = 2.25

Focus: (6.25, -2)

Directrix: x = 1.75



Locate the center, vertices, foci and asymptotes of the hyperbola, then graph.

opens left/right

23. $\dfrac{(x+5)^2}{16} - \dfrac{(y-2)^2}{9} = 1$

Center: (-5, 2)

a= 4

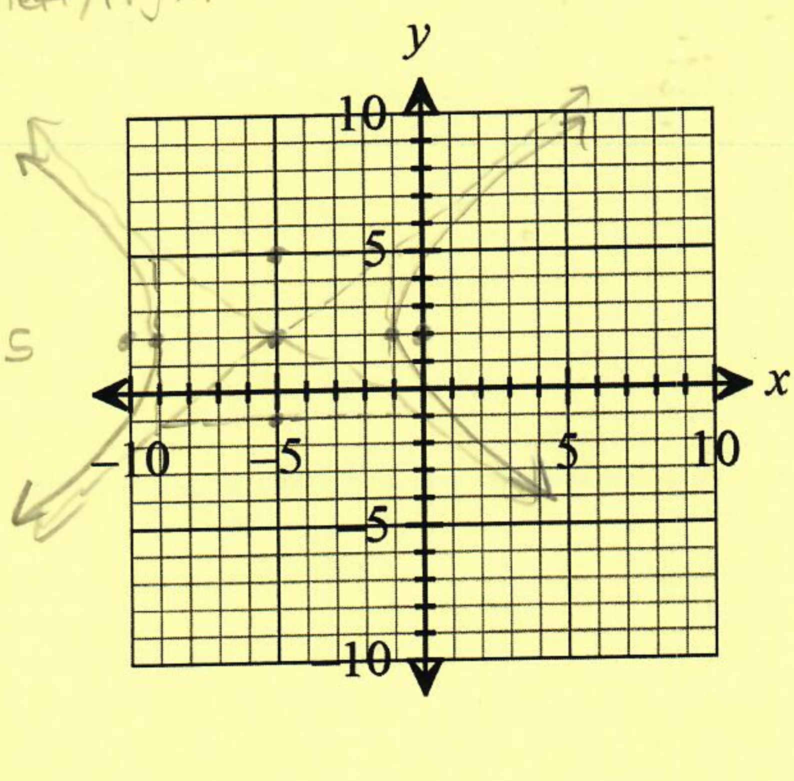
b= 3

c= $4^2+3^2=c^2$ $16+9=c^2$ $c=5$

Vertices: (-1, 2); (-9, 2)

Foci: (0, 2); (-10, 2)

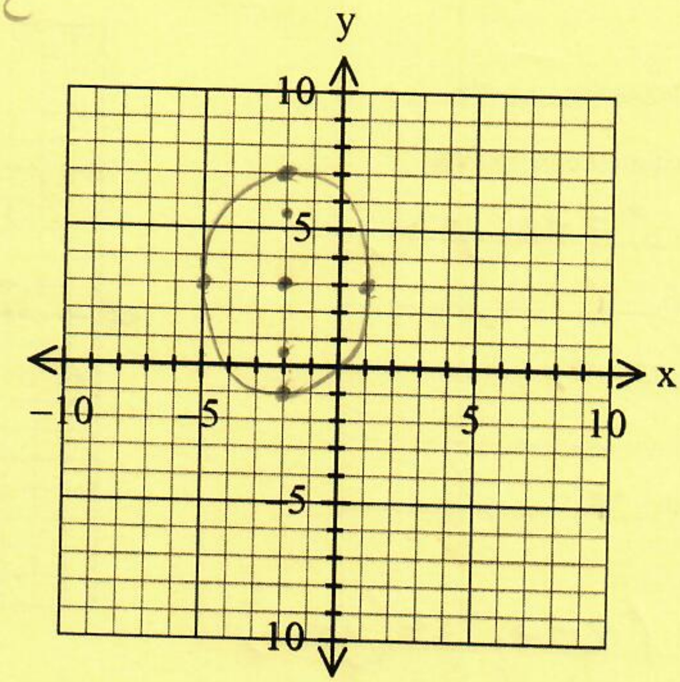
Slope of the Asymptotes: $\frac{3}{4}$, $\frac{-3}{4}$



Locate the center, vertices and foci of the ellipse, then graph.

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

24. $\frac{(x+2)^2}{9}+\frac{(y-3)^2}{16}=1$



Center: $(-2, 3)$

a= 4

b= 3

c^2= $4^2-3^2=16-9=\sqrt{7}=2.65$

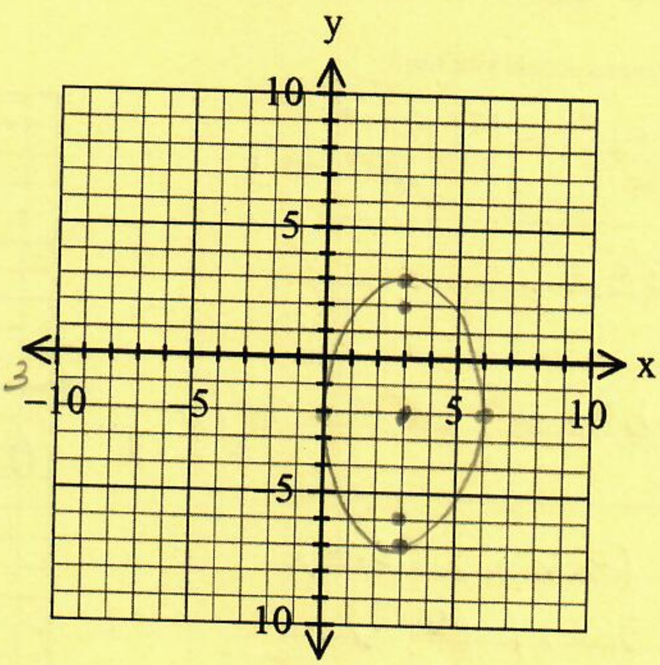
vertices: $(-2,7)$; $(-2,-1)$

foci: $(-2, 3+\sqrt{7})$; $(-2, 3-\sqrt{7})$

Write an equation in standard form for the ellipse, hyperbola, or parabola that satisfies the given conditions.

25. Foci: (3,-6) and (3,2) Vertices: (3,-7) and (3,3)

ellipse



Which equation should you use?

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

Center: $(3,-2)$

a= 5

b= $5^2-b^2=4^2$ $25-b^2=16$ $b^2=9$ $b=3$

c= 4

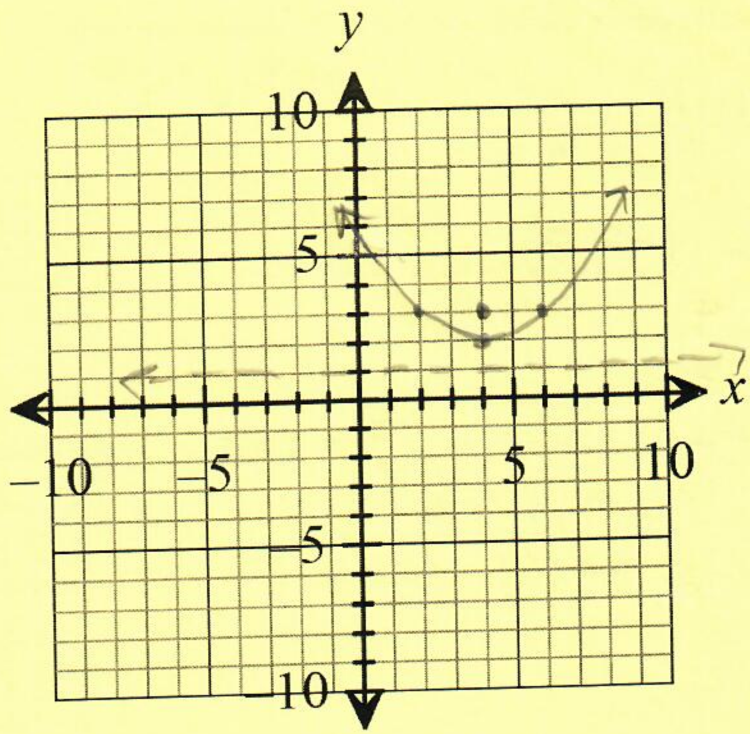
vertices: $(3,3)$; $(3,-7)$

foci: $(3,-6)$; $(3,2)$

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

parabola

26. focus=(4, 3), directrix y=1



Direction of opening up

Which equation should you use

$(x-h)^2 = 4a(y-k)$

Vertex (h,k) (4, 2)

Focus (4, 3)

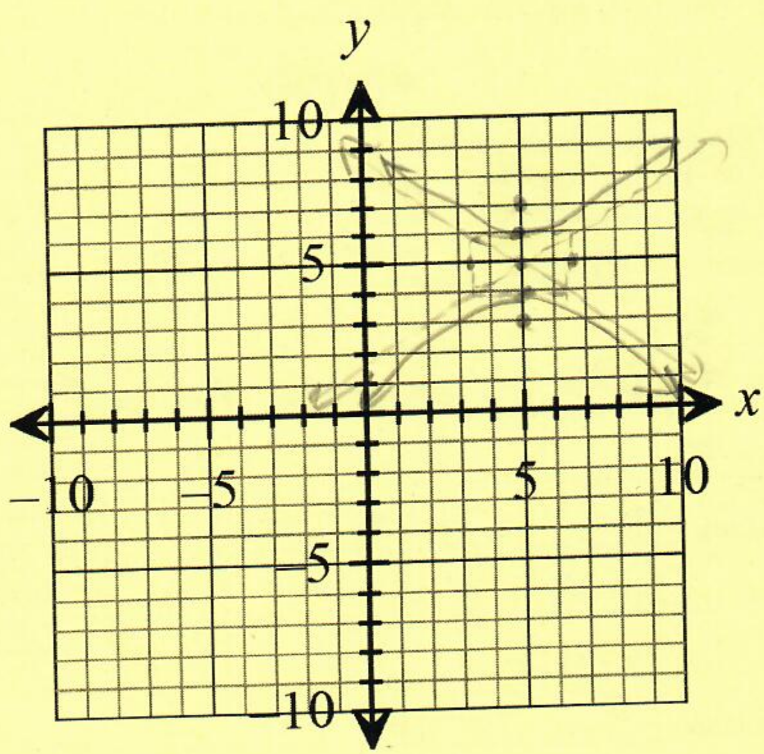
a= 1

Focal Width 4

Equation: $(x-4)^2 = 4(y-2)$

hyperbola

27. Foci at (5, 3) and (5,7); Vertex at (5, 6)



Which equations should you use?

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

Center: (5, 5)

a= 1

b= $1^2 + b^2 = 2^2$ $b^2 = 3$ $b = \sqrt{3}$
$= 1.73$

c= 2

Vertices: (5, 6) ; (5, 4)

Foci: (5, 3) ; (5, 7)

Slope of the Asymptotes: $\frac{\sqrt{3}}{1}$, $-\frac{\sqrt{3}}{1}$

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