Warm-up:

Graph the hyperbola below: label the vertices, foci and equations of asymptotes for: $9y^2 - x^2 + 2x + 54y = -62$

1. $\dfrac{(x+1)^2}{144} - \dfrac{(y-2)^2}{25} = 1$

$9y^2 + 54y \quad -x^2 + 2x \quad = -62$

$9(y^2 + 6y + 9) - (x^2 - 2x + 1) = -62$ $+81$ -1

$9(y+3)^2 - (x-1)^2 = 18$

Find the equation of the hyperbola given the following:

2. Transverse axis endpoints (2, -2) and (2, 6), slope of one asymptote 4/3

3.

4. $a = 3, b = 4, c = \sqrt{9 + 16} = 5;$
Vertices: $(\pm 3, 0)$; Foci: $(\pm 5, 0)$

5. $\dfrac{x^2}{4} - \dfrac{y^2}{3} = 1; a = 2, b = \sqrt{3}, c = \sqrt{7};$
Vertices: $(\pm 2, 0)$; Foci: $(\pm\sqrt{7}, 0)$

7. (c)

8. (b)

9. (a)

10. (d)

24. $c = 3$ and $b = 2$, so $a = \sqrt{c^2 - b^2} = \sqrt{5}$: $\dfrac{y^2}{4} - \dfrac{x^2}{5} = 1$

26. $c = 5$ and $a = 3/2$, so $b = \sqrt{c^2 - a^2} = \dfrac{1}{2}\sqrt{91}$:

$$\frac{x^2}{2.25} - \frac{y^2}{22.75} = 1 \text{ or } \frac{x^2}{9/4} - \frac{y^2}{91/4} = 1$$

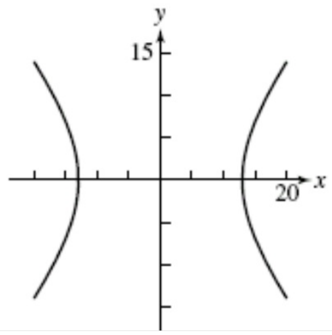
28. $a = 4$ and $c = ea = 6$, so $b = \sqrt{36 - 16} = 2\sqrt{5}$:

$$\frac{y^2}{16} - \frac{x^2}{20} = 1$$

14. Transverse axis from $(-13, 0)$ to $(13, 0)$;

$y = \pm\frac{12}{13}x,$

$y = \pm\frac{12}{13}\sqrt{x^2 - 169}$



32. The center (h, k) is $(-1, 3)$ (the midpoint of the transverse axis endpoints); $a = 6$, half the length of the transverse axis. And $b = 5$, half the length of the conjugate axis.

$$\frac{(x+1)^2}{36} - \frac{(y-3)^2}{25} = 1$$

34. The center (h, k) is $\left(-2, \frac{5}{2}\right)$, the midpoint of the transverse axis); $a = \frac{9}{2}$, half the length of the transverse axis. Since $|a/b| = \frac{4}{3}$, $b = \frac{27}{8}$:

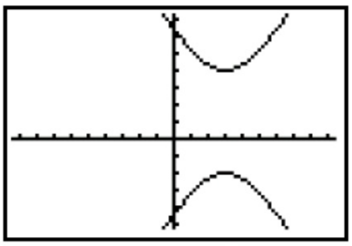
$$\frac{(y - 5/2)^2}{81/4} - \frac{(x+2)^2}{729/64} = 1$$

36. The center (h, k) is $\left(-3, -\frac{11}{2}\right)$, the midpoint of the transverse axis. $b = \frac{7}{2}$, half the length of the transverse axis. The center-to-focus distance is $c = \frac{11}{2}$, so

$a = \sqrt{c^2 - b^2} = \sqrt{18}$: $\dfrac{(y+5.5)^2}{49/4} - \dfrac{(x+3)^2}{18} = 1$

40. Center $(-4, -6)$; Vertices: $(-4 \pm \sqrt{12}, -6)$;
Foci: $(-4 \pm 5, -6) = (1, -6), (-9, -6)$

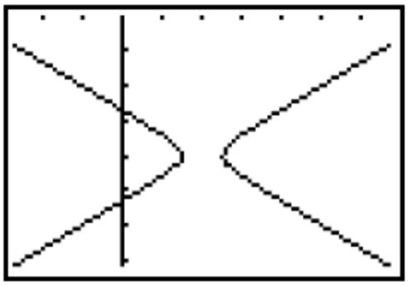
47.



[–9.4, 9.4] by [–5.2, 7.2]

Divide the entire equation by 36. Vertices: $(3, -2)$ and $(3, 4)$, Foci: $(3, 1 \pm \sqrt{13})$, $e = \frac{\sqrt{13}}{3}$.

48.



[–2.8, 6.8] by [–7.1, 0]

Vertices: $\left(\frac{3}{2}, -4\right)$ and $\left(\frac{5}{2}, -4\right)$, Foci: $\left(2 \pm \frac{\sqrt{13}}{6}, -4\right)$

$$e = \frac{\sqrt{(1/4) + (1/9)}}{1/2} = 2\sqrt{\frac{9+4}{36}} = \frac{\sqrt{13}}{3}.$$

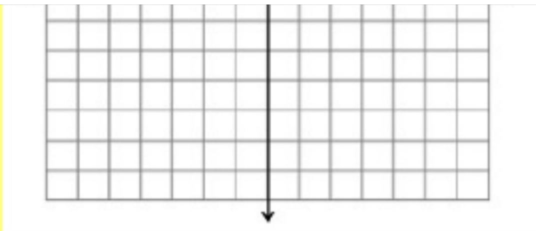
52. $a = \sqrt{2}$, $(h, k) = (0, 0)$ and the hyperbola opens upward and downward, so $\frac{y^2}{2} - \frac{x^2}{b^2} = 1$. Using $(2, -2)$:

$$\frac{4}{2} - \frac{4}{b^2} = 1, \frac{4}{b^2} = 1, b^2 = 4; \frac{y^2}{2} - \frac{x^2}{4} = 1$$

11. Find the coordinates of the vertices and foci and the equations of the asymptotes for the hyperbola with equation

$$-y^2 + x^2 + 6x + 10y - 17 = 0$$

$\boxed{9x^2 - y^2 - 36x - 6y + 18 = 0}$



$9x^2 - 36x \quad -y^2 - 6y = -18$

$9(x^2 - 4x + 4) - (y^2 + 6y + 9) = -18 + 36 - 9$

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

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

"KINDA"

Conic Section in Standard Form

$$f(x) = Ax^2 + Bx + Cy^2 + Dy + E$$

-->If A or C = 0 it is a parabola. $x^2 = 4py$ $y^2 = 4px$

-->If A = C it is a circle. $2x^2 + 2y^2 = 12$

-->If A and C have the same sign but different value it is an ellipse. $3x^2 + 2y^2 = 12$

-->If A and C have different signs it is a hyperbola. $3x^2 - 2y^2 = 12$

Write each equation in standard form. State whether the graph of the equation is a *parabola, circle, ellipse,* or *hyperbola*.

1. $x^2 + y^2 - 9 = 0$ C

2. $x^2 - 4y^2 = 4$ H

3. $x^2 + 2x - 7 = y$ P

4. $3y^2 - 18y - 11 = -x$ P

5. The cross section of a mirror is modeled by $\frac{1}{25}x^2 = y$. P

What is the shape of the cross section of the mirror? $x^2 = 25y$

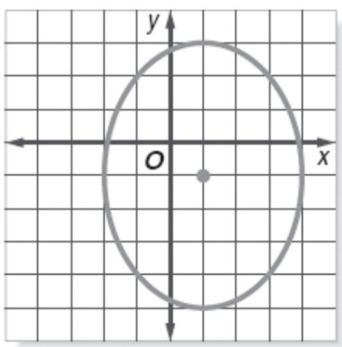
6. **Standardized Test Practice** What is the equation of the graph below?

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

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

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

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



Given $f(x) = 9x^2 - y^2 - 36x - 6y + 18 = 0$

1. What type of conic is this an equation for?
2. Put in Standard form
3. Find all of the following: center, verticies, foci, directrix, and asymptotes if they exist.
4. Graph

Given $f(x) = 3x^2 + y^2 + 18x - 2y - 8 = 0$

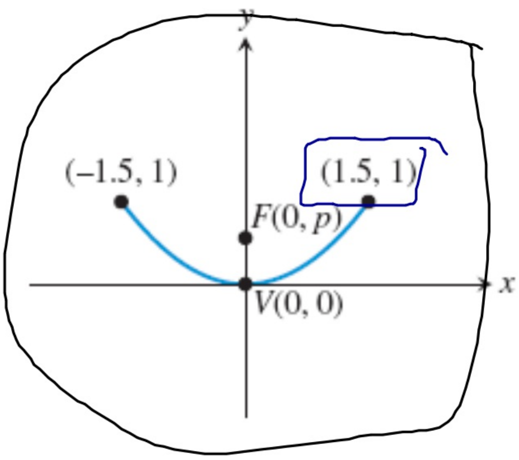
1. What type of conic is this an equation for?
2. Put in Standard form
3. Find all of the following: center, verticies, foci, directrix, and asymptotes if they exist.
4. Graph

Given $f(x) = y^2 + 8x + 6y + 25 = 0$

1. What type of conic is this an equation for?
2. Put in Standard form
3. Find all of the following: center, verticies, foci, directrix, and asymptotes if they exist.
4. Graph

11. **Studying a Parabolic**

On the sidelines of each of its televised football games, the FBTV network uses a parabolic reflector with a microphone at the reflector's focus to capture the conversations among players on the field. If the parabolic reflector is 3 ft across and 1 ft deep, where should the microphone be placed?



$x^2 = 4py$

$(1.5)^2 = 4p(1)$

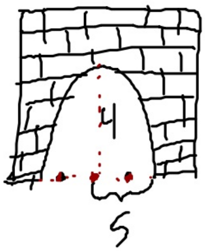
$2.25 = 4p$

$.5625 = p$

$\boxed{F: (0, .5625)}$

Applications

1. A fireplace is to be in the shape of a semi-ellipse where the height needs to be 4 ft and the width needs to be 10 ft. Find an equation for the fireplace. If a string is to be tacked down to draw an outline of the fireplace how far should it be placed from the center?



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

$25 - 16 = c^2$

$9 = c^2$

$3 = c$

3 feet

A. The minimum is 272 miles and the maximum is 648 miles.

B. The minimum is 3608 miles and the maximum is 4232 miles.

C. $(x - 1)^2 + (y - 3)^2 = 144$

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

E. (0, 5) and (4, 3)

F. 23.42 feet

G. $\frac{x^2}{256} + \frac{y^2}{196} = 1$

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

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

J. (5, 2), (−5, −2), (2, 5), and (−2, −5)

K. 22 feet

L. 21 feet

M. (6, 2), (−6, −2), (2, 6), and (−2, −6)

N. (−2, 4) and (−2, −2)

O. $7x^2 + 7y^2 + 19x - 37y - 222 = 0$

P. 17.89 meters

Q. (1, 4)

R. 75.625 meters

S. $\left(-2, \frac{5}{2}\right)$

T. $\left(\frac{3}{4}, 4\right)$

U. $(x-3)^2 = -6\left(y + \frac{1}{2}\right)$

V. $(x-1)^2 + (y-1)^2 = 5$ and $(x+2)^2 + (y+2)^2 = 5$

W. $(x+2)^2 + (y+2)^2 = 5$ and $(x+1)^2 + (y+1)^2 = 5$

X. $(-2, 2)$

Y. $(x+3)^2 = 6\left(y + \frac{1}{2}\right)$

1. Write an equation for a circle if the endpoints of a diameter are at (-7,1) and (5,1). Sketch the graph.

2. Write an equation for an ellipse if the endpoints of the major axis are at (-1,5) and (-1,-3) and the endpoints of the minor axis are at (-4,1) and (2,1)

Quick game

One person in each row/group grab a white board

Name the conic and change to standard form

1) $-x^2 + 10x + y - 21 = 0$

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

3) $x^2 - y^2 - 2x - 8 = 0$

4) $9x^2 + 16y^2 + 54x - 32y - 47 = 0$

5) $-9x^2 + y^2 - 72x - 153 = 0$

6) $y^2 - 8x - 4y + 20 = 0$

Name the conic and change to standard form

1) $-9x^2 + 25y^2 - 100y - 125 = 0$

2) $9x^2 + 16y^2 + 54x - 32y - 47 = 0$

3) $9x^2 + 4y^2 - 54x - 8y - 59 = 0$

4) $-25x^2 + y^2 - 100x - 125 = 0$

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

6) $y^2 + x + 10y + 26 = 0$