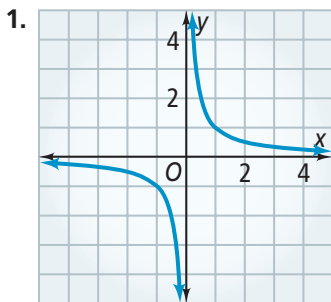## Vocabulary

● Review

Write the equation of the vertical and horizontal *asymptotes* in each graph.

1.

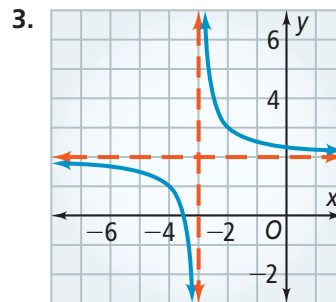Vertical: [ ]

Horizontal: [ ]

2.

Vertical: [ ]

Horizontal: [ ]

3.
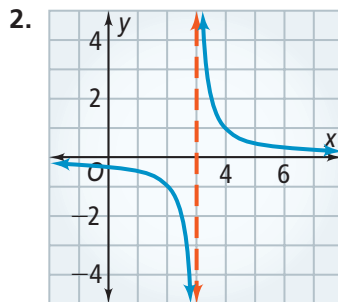
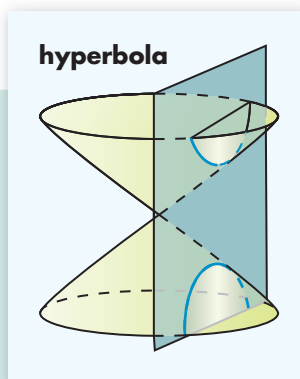Vertical: [ ]

Horizontal: [ ]

● Vocabulary Builder

hyperbola

hyperbola (noun) **hy PUR buh luh**

Definition: When a plane, parallel to the axis of a *double cone*, slices the double cone, a *conic section* called a **hyperbola** is formed.

Main Idea: A **hyperbola** has two foci, two vertices, and two curves.
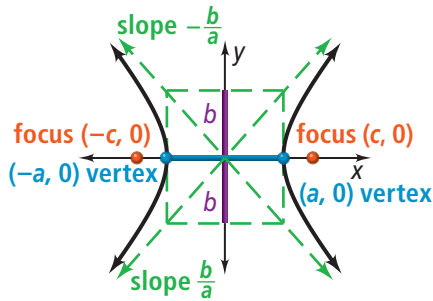
● Use Your Vocabulary

Write T for *true* or F for *false*.

[ ] **4.** The graph of a hyperbola consists of only one curve.

[ ] **5.** A hyperbola is *not* a conic section.

[ ] **6.** A hyperbola has two vertices and two foci.

Key Concept Properties of Hyperbolas with Centers (0, 0)

Horizontal Hyperbola

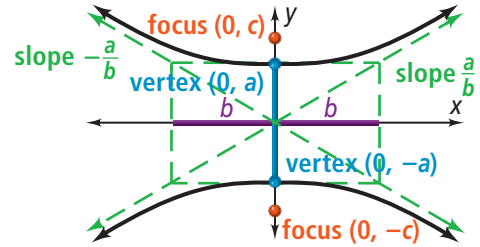Equation: $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$

Transverse axis: Horizontal

Vertices $(\pm a, 0)$

Foci: $(\pm c, 0)$, where $c^2 = a^2 + b^2$

Asymptotes: $y = \pm \dfrac{b}{a}x$

Vertical Hyperbola

Equation: $\dfrac{y^2}{a^2} - \dfrac{x^2}{b^2} = 1$

Transverse axis: Vertical

Vertices $(0, \pm a)$

Foci: $(0, \pm c)$, where $c^2 = a^2 + b^2$

Asymptotes: $y = \pm \dfrac{a}{b}x$

Problem 1 Writing and Graphing the Equation of a Hyperbola

Got It? What is the standard-form equation of the hyperbola with the vertices
$(0, \pm 4)$ and foci $(0, \pm 5)$?

7. The vertices are $(0, \pm 4)$, so $a = \boxed{}$.

8. The foci are $(0, \pm 5)$. Then $c = \boxed{}$.

9. Use the values you found for a and c and $c^2 = a^2 + b^2$ to find b.

10. The vertices and foci are on the x-axis / y-axis .

11. The transverse axis of the hyperbola is horizontal / vertical .

12. Complete the steps to find the standard form of the equation of the hyperbola.

$\dfrac{y^2}{a^2} - \dfrac{x^2}{b^2} = 1$ Write the standard form.

$\dfrac{y^2}{\boxed{}} - \dfrac{x^2}{\boxed{}} = 1$ Substitute values for a and b.

$\dfrac{y^2}{\boxed{}} - \dfrac{x^2}{\boxed{}} = 1$ Simplify.

Lesson 10-5

Got It? What are the vertices, foci, and asymptotes of the hyperbola with equation $9x^2 - 4y^2 = 36$? Sketch a graph. Use a graphing calculator to check your sketch.

13. Write the equation in standard form. Divide each side by the same number to get 1 on the right side.

14. Circle all statements that are *true* for this hyperbola.

The transverse axis is horizontal.	The transverse axis is vertical.
The vertices are on the *y*-axis.	The vertices are on the *x*-axis.
The foci are on the *y*-axis.	The foci are on the *x*-axis.

15. Use the standard form of the equation to identify the values of a^2, a, b^2, and b.

$a^2 = $ $a = $ $b^2 = $ $b = $

16. Use the values you found for a and b and $c^2 = a^2 + b^2$ to find c^2 and c.

$c^2 = $ $c = $

17. The vertices are $(\pm$ $, 0)$ and the foci are $(\pm$ $, 0)$.

The slopes of the asymptotes are $m = \pm\frac{b}{a}$, so $m = \pm$.

The equations of the asymptote are $y = \pm$ x.

18. Plot the vertices and foci. Draw dashed lines for the asymptotes. Then sketch a graph the hyperbola.

19. Solve the equation for *y*.

20. Use your graphing calculator to graph the two equations you found in Exercise 19 on the same screen. Compare the graph on your screen to your sketch.

_____

_____

Lesson Check • Do you UNDERSTAND?

Error Analysis Your friend says that a graph must be a vertical hyperbola because the greater denominator is under the y^2 term. What error did your friend make?

21. Circle the equation that represents a vertical hyperbola. Underline the equation that represents a horizontal hyperbola

$$\frac{y^2}{36} - \frac{x^2}{9} = 1 \qquad\qquad \frac{x^2}{9} - \frac{y^2}{36} = 1$$

22. Name one way the two equations differ.

_____

_____

_____

Math Success

Check off the vocabulary words that you understand.

☐ hyperbola ☐ focus of the hyperbola ☐ vertex ☐ transverse axis

Rate how well you can *graph a hyperbola*.

Need to review 0 2 4 6 8 10 Now I get it!