pg. 645 4-32 evens, 38, 39, (37)

GRAPHING Graph the equation. Identify the vertices, foci, and asymptotes of the hyperbola.

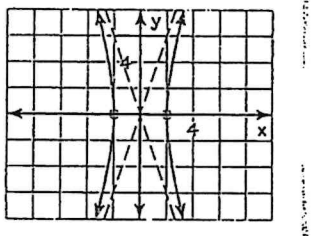
3. $\frac{x^2}{25} - \frac{y^2}{4} = 1$
4. $\frac{x^2}{9} - \frac{y^2}{36} = 1$
5. $\frac{y^2}{81} - \frac{x^2}{25} = 1$
6. $\frac{x^2}{144} - \frac{y^2}{36} = 1$
7. $\frac{y^2}{196} - \frac{x^2}{100} = 1$
8. $\frac{y^2}{49} - \frac{x^2}{121} = 1$
9. $4x^2 - y^2 = 256$
10. $49x^2 - 4y^2 = 196$
11. $9y^2 - 25x^2 = 225$
12. $25y^2 - 64x^2 = 1600$
13. $81x^2 - 16y^2 = 1296$
14. $49y^2 - 100x^2 = 4900$

15. ★ **MULTIPLE CHOICE** What are the foci of the hyperbola with equation $45y^2 - 200x^2 = 1800$?

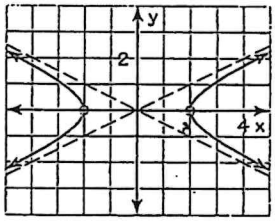
Ⓐ $(\pm 2\sqrt{10}, 0)$ Ⓑ $(0, \pm 2\sqrt{10})$ Ⓒ $(\pm 7, 0)$ Ⓓ $(0, \pm 7)$

ERROR ANALYSIS *Describe* and correct the error in graphing the equation.

16. $\frac{y^2}{36} - \frac{x^2}{4} = 1$



17. $\frac{x^2}{4} - y^2 = 4$



WRITING EQUATIONS Write an equation of the hyperbola with the given foci and vertices.

18. Foci: $(0, -4)$, $(0, 4)$
Vertices: $(0, -2)$, $(0, 2)$

19. Foci: $(-6, 0)$, $(6, 0)$
Vertices: $(-2, 0)$, $(2, 0)$

20. Foci: $(-5, 0)$, $(5, 0)$
Vertices: $(-1, 0)$, $(1, 0)$

21. Foci: $(0, -12)$, $(0, 12)$
Vertices: $(0, -7)$, $(0, 7)$

22. Foci: $(-10, 0)$, $(10, 0)$
Vertices: $(-5\sqrt{3}, 0)$, $(5\sqrt{3}, 0)$

23. Foci: $(0, -4\sqrt{5})$, $(0, 4\sqrt{5})$
Vertices: $(0, -4)$, $(0, 4)$

24. Foci: $(0, -3)$, $(0, 3)$
Vertices: $(0, -2\sqrt{2})$, $(0, 2\sqrt{2})$

25. Foci: $(-3\sqrt{6}, 0)$, $(3\sqrt{6}, 0)$
Vertices: $(-2, 0)$, $(2, 0)$

26. ★ **MULTIPLE CHOICE** What is an equation of the hyperbola with foci at $(0, -6\sqrt{3})$ and $(0, 6\sqrt{3})$ and with vertices at $(0, -8)$ and $(0, 8)$?

Ⓐ $\frac{x^2}{64} - \frac{y^2}{108} = 1$ Ⓑ $\frac{x^2}{44} - \frac{y^2}{68} = 1$ Ⓒ $\frac{y^2}{64} - \frac{x^2}{44} = 1$ Ⓓ $\frac{y^2}{108} - \frac{x^2}{64} = 1$

GRAPHING In Exercises 27–32, the equations of parabolas, circles, ellipses, and hyperbolas are given. Graph the equation.

27. $\frac{x^2}{25} - \frac{y^2}{49} = 1$

28. $y^2 = 18x$

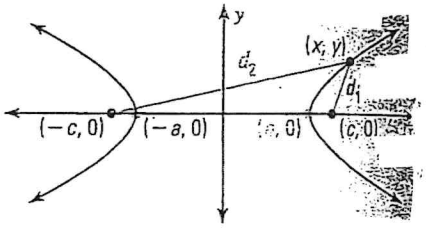
29. $48x^2 + 12y^2 = 48$

30. $\frac{x^2}{144} + \frac{y^2}{256} = 1$

31. $\frac{y^2}{25} - \frac{x^2}{121} = 1$

32. $18x^2 + 18y^2 = 288$

37. **CHALLENGE** Using the distance formula and the definition of a hyperbola, write an equation in standard form of the hyperbola with foci at $(\pm 2, 0)$ if the difference in the distances from a point (x, y) on the hyperbola to the foci is 2.



PROBLEM SOLVING

38. **TELESCOPES** A satellite is carrying a telescope that has a hyperbolic mirror for which $a = 33$ and $c = 56$ (in centimeters). Write an equation for the cross section of the mirror if the transverse axis is horizontal.

39. **SPINNING CUBE** The outline of a cube spinning around an axis through a pair of opposite corners contains a portion of a hyperbola, as shown. The coordinates given represent a vertex and a focus of the hyperbola for a cube that measures 1 unit on each edge. Write an equation that models this hyperbola.