

10.4 EXERCISES

In Problems 1–4, the graph of a hyperbola is given. Match each graph to its equation.

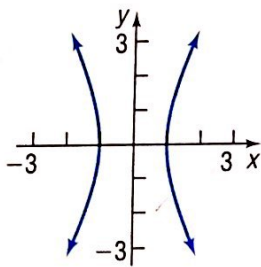
A. $\frac{x^2}{4} - y^2 = 1$

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

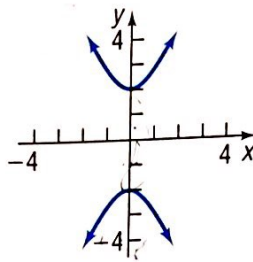
C. $\frac{y^2}{4} - x^2 = 1$

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

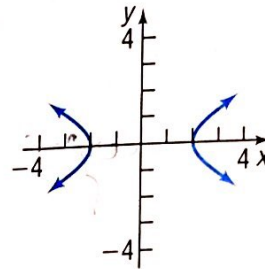
1.



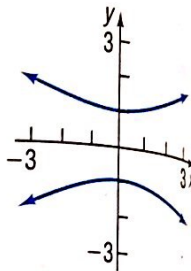
2.



3.



4.



In Problems 5–8, the graph of a hyperbola is given. Match each graph to its equation.

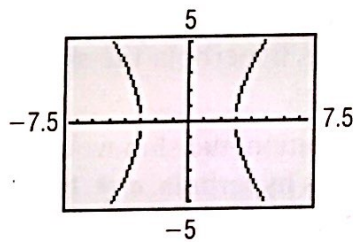
A. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

B. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

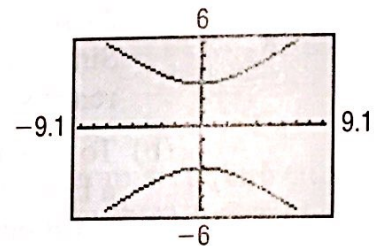
C. $\frac{y^2}{16} - \frac{x^2}{9} = 1$

D. $\frac{y^2}{9} - \frac{x^2}{16} = 1$

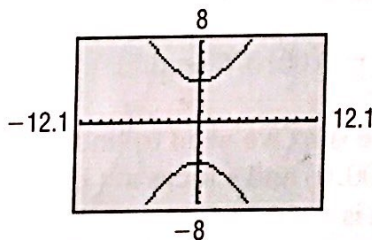
5.



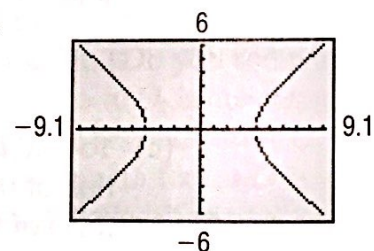
6.



7.



8.



In Problems 9–18, find an equation for the hyperbola described. Graph the equation using a graphing utility.

9. Center at (0, 0); focus at (3, 0); vertex at (1, 0)

11. Center at (0, 0); focus at (0, -6); vertex at (0, 4)

13. Foci at (-5, 0) and (5, 0); vertex at (3, 0)

15. Vertices at (0, -6) and (0, 6); asymptote the line $y = 2x$

17. Foci at (-4, 0) and (4, 0); asymptote the line $y = -x$

10. Center at (0, 0); focus at (0, 5); vertex at (0, 3)

12. Center at (0, 0); focus at (-3, 0); vertex at (2, 0)

14. Focus at (0, 6); vertices at (0, -2) and (0, 2)

16. Vertices at (-4, 0) and (4, 0); asymptote the line $y = 2x$

18. Foci at (0, -2) and (0, 2); asymptote the line $y = -x$

In Problems 19–26, find the center, transverse axis, vertices, foci, and asymptotes. Graph each equation (a) by hand and (b) using a graphing utility.

19. $\frac{x^2}{25} - \frac{y^2}{9} = 1$

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

23. $y^2 - 9x^2 = 9$

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

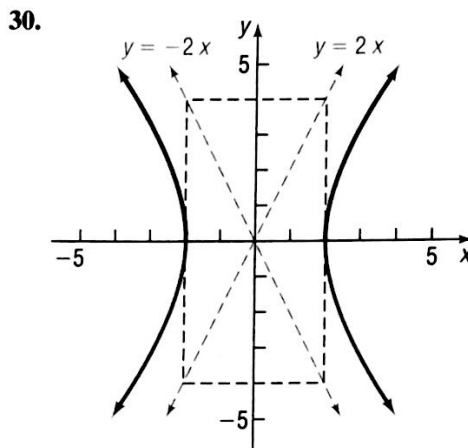
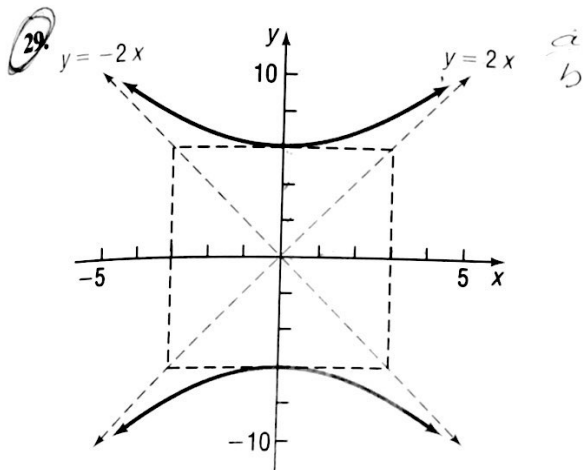
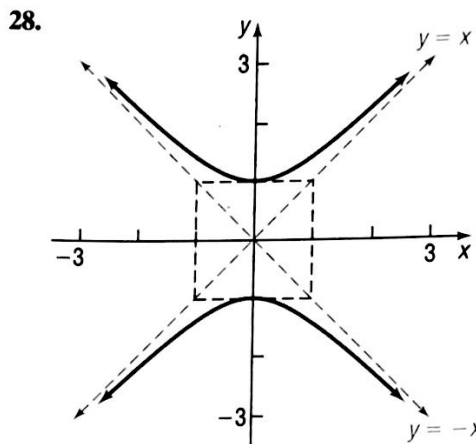
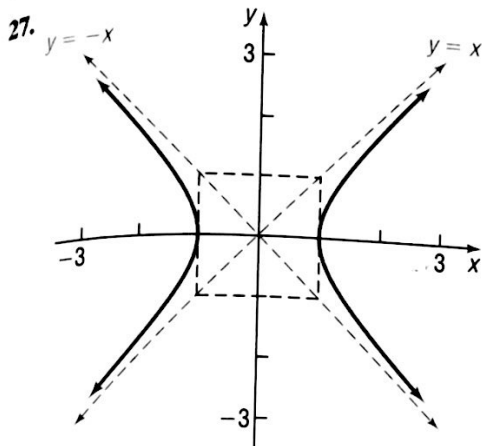
21. $4x^2 - y^2 = 16$

22. $y^2 - 4x^2 = 16$

25. $y^2 - x^2 = 25$

26. $2x^2 - y^2 = 4$

In Problems 27–30, write an equation for each hyperbola.



In Problems 31–38, find an equation for the hyperbola described. Graph the equation by hand.

31. Center at (4, -1); focus at (7, -1); vertex at (6, -1)

32. Center at (-3, 1); focus at (-3, 6); vertex at (-3, 4)

33. Center at (-3, -4); focus at (-3, -8); vertex at (-3, -2)

34. Center at (1, 4); focus at (-2, 4); vertex at (0, 4)

35. Foci at (3, 7) and (7, 7); vertex at (6, 7)

36. Focus at (-4, 0); vertices at (-4, 4) and (-4, 2)

37. Vertices at (-1, -1) and (3, -1); asymptote the line $(x - 1)/2 = (y + 1)/3$

38. Vertices at (1, -3) and (1, 1); asymptote the line $(x - 1)/2 = (y + 1)/3$

In Problems 39–52, find the center, transverse axis, vertices, foci, and asymptotes. Graph each equation using a graphing utility.

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

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

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

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

43. $(x + 1)^2 - (y + 2)^2 = 4$

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

45. $x^2 - y^2 - 2x - 2y - 1 = 0$

46. $y^2 - x^2 - 4y + 4x - 1 = 0$

47. $y^2 - 4x^2 - 4y - 8x - 4 = 0$

48. $2x^2 - y^2 + 4x + 4y - 4 = 0$

49. $4x^2 - y^2 - 24x - 4y + 16 = 0$

50. $2y^2 - x^2 + 2x + 8y + 3 = 0$

51. $y^2 - 4x^2 - 16x - 2y - 19 = 0$

52. $x^2 - 3y^2 + 8x - 6y + 4 = 0$