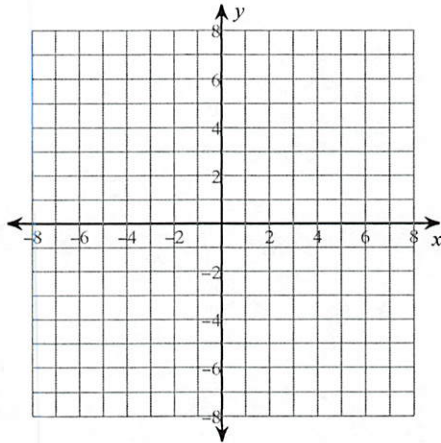


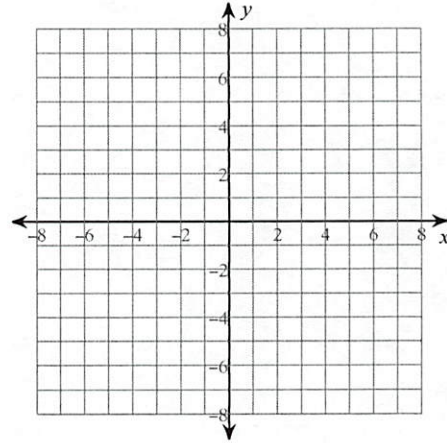
# Hyperbolas

Identify the center, vertices, foci, eccentricity, equation of the asymptotes, and direction of opening. Then sketch the graph.

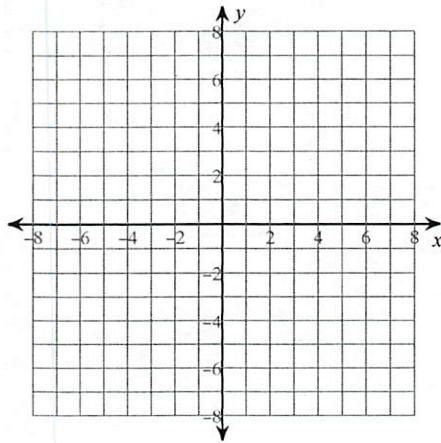
1)  $\frac{x^2}{25} - \frac{y^2}{9} = 1$



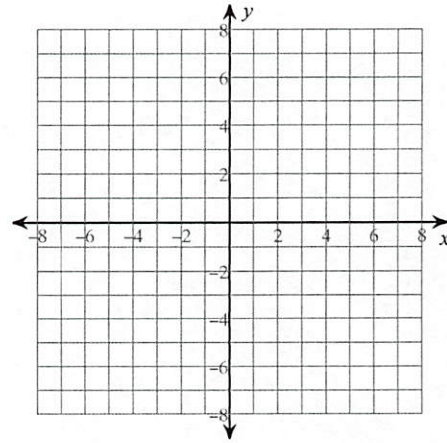
2)  $\frac{x^2}{9} - \frac{y^2}{16} = 1$



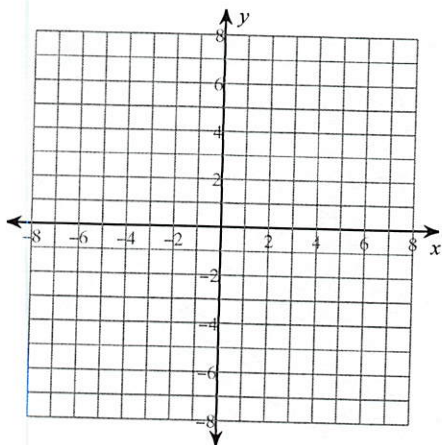
3)  $-x^2 + 16y^2 - 16 = 0$



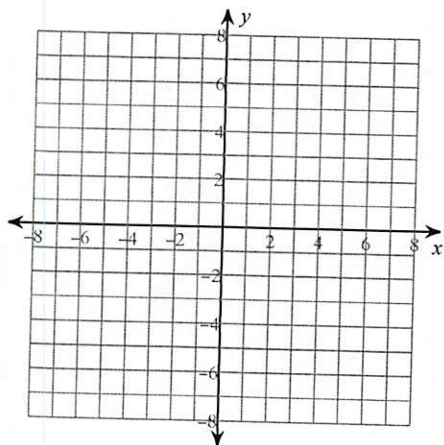
4)  $-9x^2 + y^2 - 9 = 0$



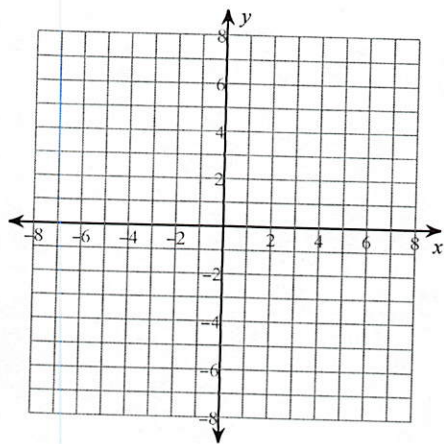
$$5) \frac{(y+2)^2}{4} - \frac{(x+2)^2}{9} = 1$$



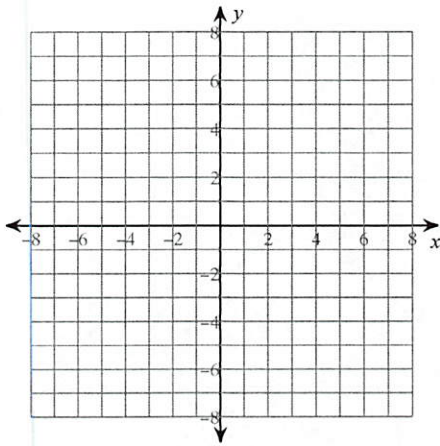
$$6) \frac{(x-3)^2}{4} - \frac{(y-1)^2}{16} = 1$$



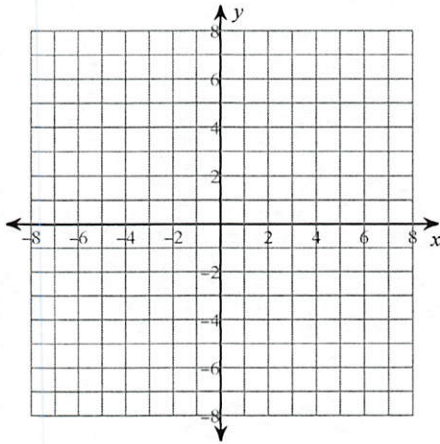
$$7) \frac{(y+2)^2}{4} - \frac{(x+1)^2}{16} = 1$$



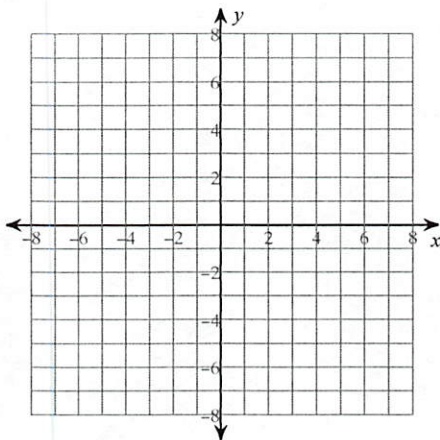
$$8) \frac{(x+1)^2}{16} - \frac{y^2}{25} = 1$$



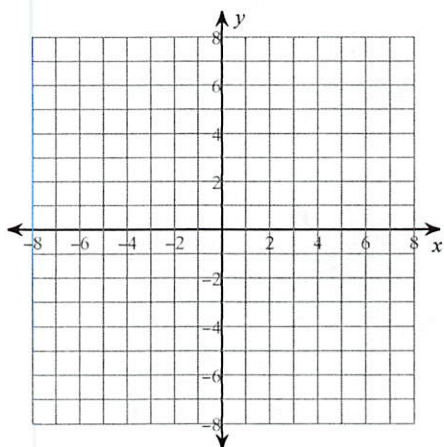
$$9) 9x^2 - 4y^2 + 36x + 16y - 16 = 0$$



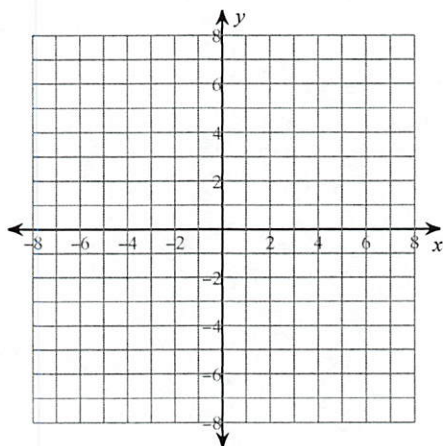
$$10) -25x^2 + y^2 - 50x - 50 = 0$$



$$11) 9x^2 - 25y^2 - 100y - 325 = 0$$



$$12) -25x^2 + 9y^2 + 50x - 250 = 0$$



Use the information provided to write the standard form equation of each hyperbola.

13) Vertices:  $(-1, 9), (-15, 9)$   
 Endpoints of Conjugate Axis:  $(-8, 18)$   
 $(-8, 0)$

14) Vertices:  $(2, 4), (-18, 4)$   
 Foci:  $(-8 + 10\sqrt{2}, 4), (-8 - 10\sqrt{2}, 4)$

15) Vertices:  $(3, 17), (3, -3)$   
 Asymptotes:  $y = \frac{5}{3}x + 2$   
 $y = -\frac{5}{3}x + 12$

16) Foci:  $(1 + 2\sqrt{61}, 6), (1 - 2\sqrt{61}, 6)$   
 Endpoints of Conjugate Axis:  $(1, 16)$   
 $(1, -4)$

17) Center at  $(-10, 7)$   
 Vertex at  $(3, 7)$   
 Eccentricity =  $\frac{5\sqrt{10}}{13}$

18) Center at  $(6, 4)$   
 Transverse axis is vertical and 18 units long  
 Conjugate axis is 20 units long