

Graphing and Properties of Hyperbolas

Identify the vertices, foci, and direction of opening of each.

1) $\frac{x^2}{81} - \frac{y^2}{4} = 1$

2) $\frac{x^2}{121} - \frac{y^2}{81} = 1$

3) $\frac{y^2}{25} - \frac{x^2}{16} = 1$

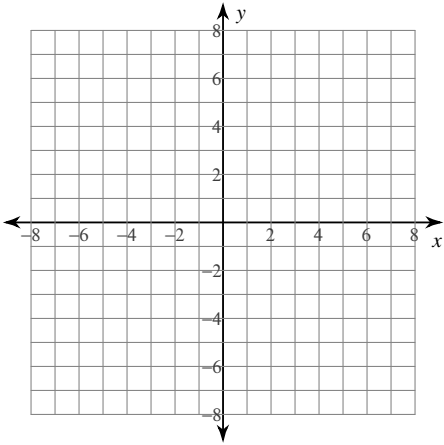
4) $\frac{x^2}{121} - \frac{y^2}{36} = 1$

5) $\frac{(x+2)^2}{169} - \frac{(y+8)^2}{4} = 1$

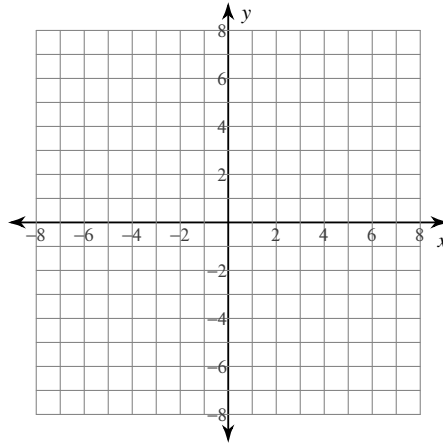
6) $\frac{(y+8)^2}{36} - \frac{(x+2)^2}{25} = 1$

Identify the vertices and foci of each. Then sketch the graph.

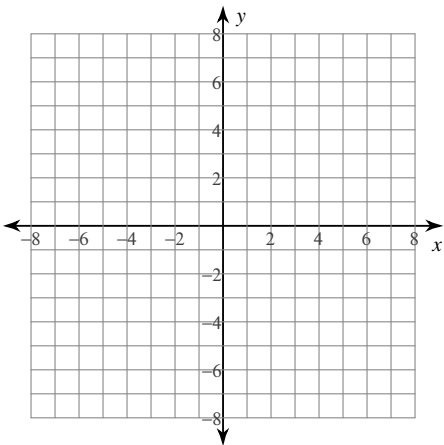
$$7) \frac{x^2}{20} - \frac{(y+1)^2}{10} = 1$$



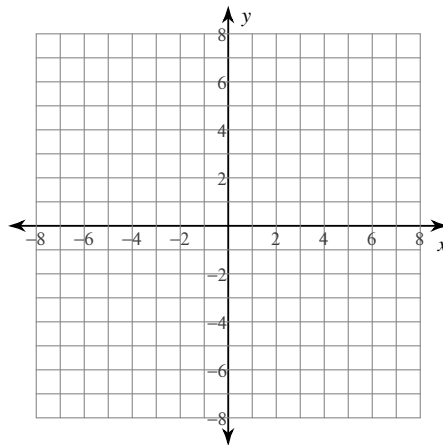
$$8) \frac{(x-3)^2}{4} - \frac{(y+1)^2}{9} = 1$$



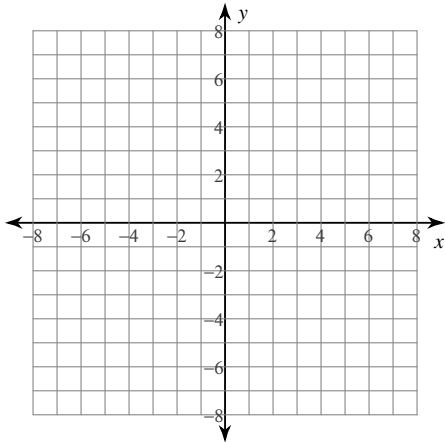
$$9) \frac{(y-1)^2}{9} - \frac{(x+1)^2}{16} = 1$$



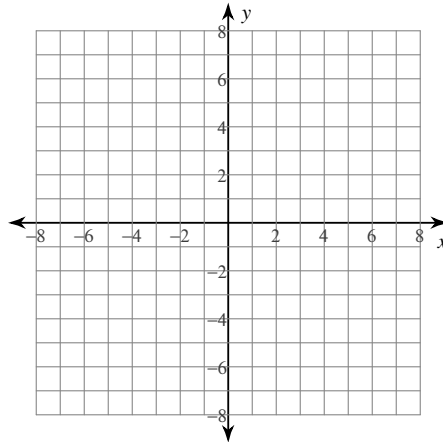
$$10) \frac{y^2}{9} - \frac{(x-2)^2}{9} = 1$$



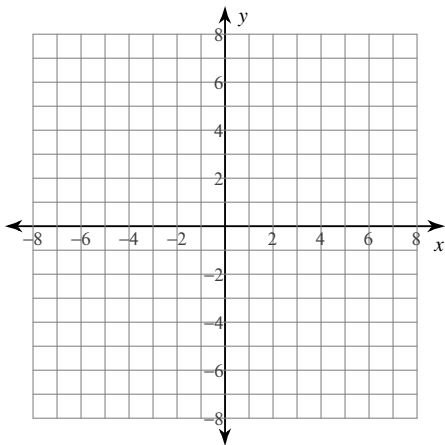
$$11) \frac{y^2}{25} - \frac{x^2}{25} = 1$$



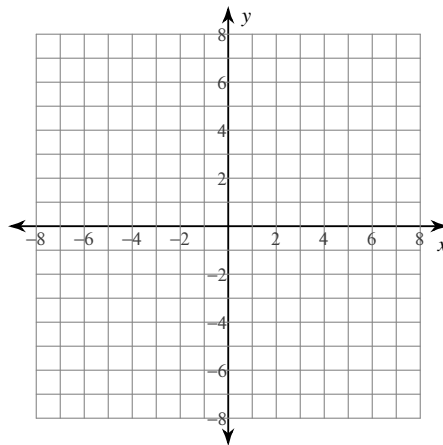
$$12) \frac{x^2}{25} - \frac{(y-2)^2}{4} = 1$$



$$13) \frac{(x-1)^2}{4} - \frac{(y-3)^2}{4} = 1$$



$$14) \frac{y^2}{9} - \frac{x^2}{25} = 1$$



Identify the asymptotes, length of the transverse axis, length of the conjugate axis, length of the latus rectum, and eccentricity of each.

$$15) -10y - y^2 = -4x^2 - 72x - 199$$

$$16) -y^2 + 12y - 19 = 18x - x^2$$

Graphing and Properties of Hyperbolas

Identify the vertices, foci, and direction of opening of each.

$$1) \frac{x^2}{81} - \frac{y^2}{4} = 1$$

Vertices: $(9, 0), (-9, 0)$
 Foci: $(\sqrt{85}, 0), (-\sqrt{85}, 0)$
 Opens left/right

$$2) \frac{x^2}{121} - \frac{y^2}{81} = 1$$

Vertices: $(11, 0), (-11, 0)$
 Foci: $(\sqrt{202}, 0), (-\sqrt{202}, 0)$
 Opens left/right

$$3) \frac{y^2}{25} - \frac{x^2}{16} = 1$$

Vertices: $(0, 5), (0, -5)$
 Foci: $(0, \sqrt{41}), (0, -\sqrt{41})$
 Opens up/down

$$4) \frac{x^2}{121} - \frac{y^2}{36} = 1$$

Vertices: $(11, 0), (-11, 0)$
 Foci: $(\sqrt{157}, 0), (-\sqrt{157}, 0)$
 Opens left/right

$$5) \frac{(x+2)^2}{169} - \frac{(y+8)^2}{4} = 1$$

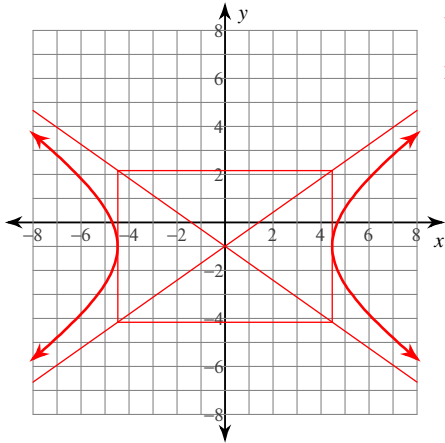
Vertices: $(11, -8), (-15, -8)$
 Foci: $(-2 + \sqrt{173}, -8), (-2 - \sqrt{173}, -8)$
 Opens left/right

$$6) \frac{(y+8)^2}{36} - \frac{(x+2)^2}{25} = 1$$

Vertices: $(-2, -2), (-2, -14)$
 Foci: $(-2, -8 + \sqrt{61}), (-2, -8 - \sqrt{61})$
 Opens up/down

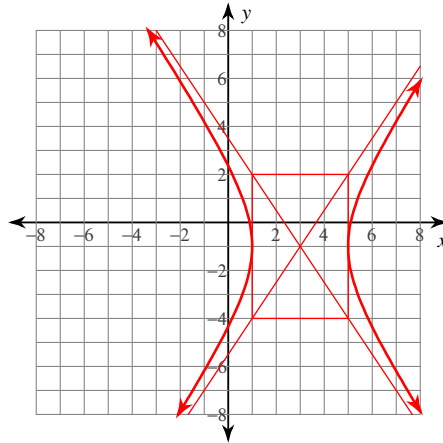
Identify the vertices and foci of each. Then sketch the graph.

$$7) \frac{x^2}{20} - \frac{(y+1)^2}{10} = 1$$



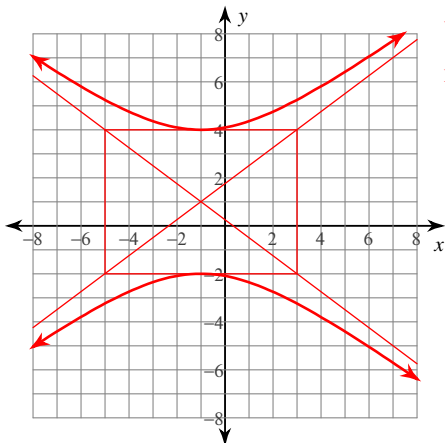
Vertices: $(2\sqrt{5}, -1)$
 $(-2\sqrt{5}, -1)$
 Foci: $(\sqrt{30}, -1)$
 $(-\sqrt{30}, -1)$

$$8) \frac{(x-3)^2}{4} - \frac{(y+1)^2}{9} = 1$$



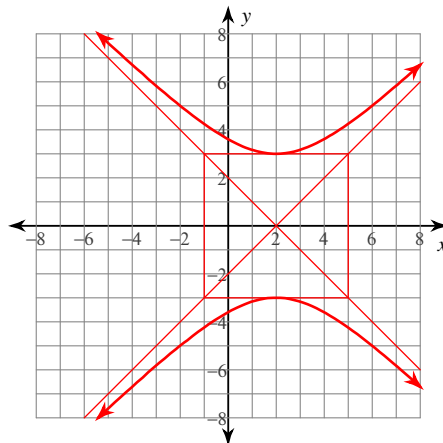
Vertices: $(5, -1)$
 $(1, -1)$
 Foci: $(3 + \sqrt{13}, -1)$
 $(3 - \sqrt{13}, -1)$

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



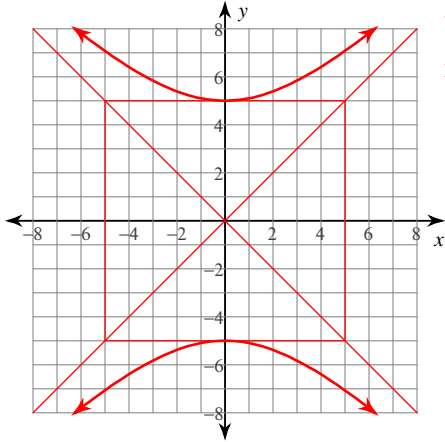
Vertices: $(-1, 4)$
 $(-1, -2)$
 Foci: $(-1, 6)$
 $(-1, -4)$

$$10) \frac{y^2}{9} - \frac{(x-2)^2}{9} = 1$$



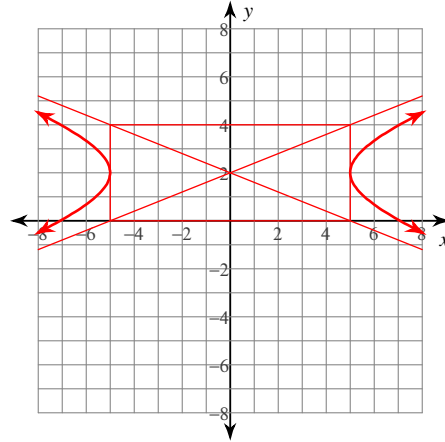
Vertices: $(2, 3)$
 $(2, -3)$
 Foci: $(2, 3\sqrt{2})$
 $(2, -3\sqrt{2})$

$$11) \frac{y^2}{25} - \frac{x^2}{25} = 1$$



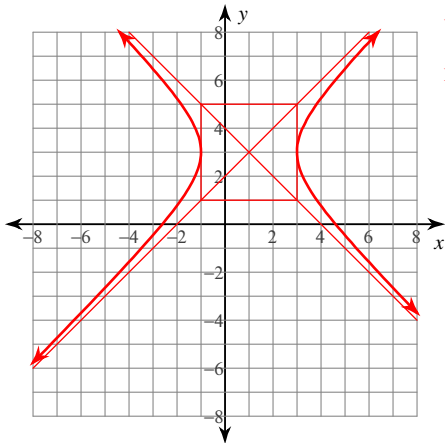
Vertices: $(0, 5)$
 $(0, -5)$
 Foci: $(0, 5\sqrt{2})$
 $(0, -5\sqrt{2})$

$$12) \frac{x^2}{25} - \frac{(y-2)^2}{4} = 1$$



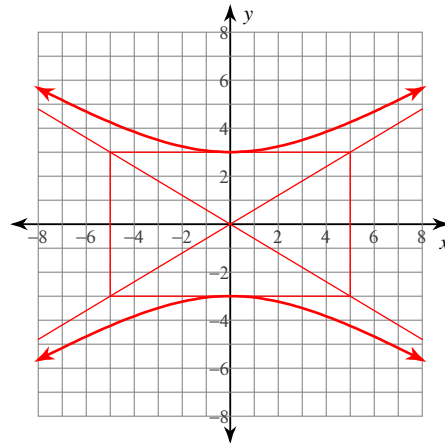
Vertices: $(5, 2)$
 $(-5, 2)$
 Foci: $(\sqrt{29}, 2)$
 $(-\sqrt{29}, 2)$

$$13) \frac{(x-1)^2}{4} - \frac{(y-3)^2}{4} = 1$$



Vertices: $(3, 3)$
 $(-1, 3)$
 Foci: $(1 + 2\sqrt{2}, 3)$
 $(1 - 2\sqrt{2}, 3)$

$$14) \frac{y^2}{9} - \frac{x^2}{25} = 1$$



Vertices: $(0, 3)$
 $(0, -3)$
 Foci: $(0, \sqrt{34})$
 $(0, -\sqrt{34})$

Identify the asymptotes, length of the transverse axis, length of the conjugate axis, length of the latus rectum, and eccentricity of each.

$$15) -10y - y^2 = -4x^2 - 72x - 199$$

Asym.: $y = 2x + 13$

$y = -2x - 23$

Transverse Axis: 10 units

Conjugate Axis: 20 units

Latus Rectum: 40 units

Eccentricity: $\sqrt{5} \approx 2.236$

$$16) -y^2 + 12y - 19 = 18x - x^2$$

Asym.: $y = x - 3$

$y = -x + 15$

Transverse Axis: 16 units

Conjugate Axis: 16 units

Latus Rectum: 16 units

Eccentricity: $\sqrt{2} \approx 1.414$