

## Hyperbolas WKST

1. Fill in the blanks.

- A \_\_\_\_\_ is the locus of points in a plane, the difference of whose distances from two fixed points is a positive constant.
- The graph of a hyperbola has two disconnected parts called \_\_\_\_\_.
- The line segment connecting the vertices of a hyperbola is called the \_\_\_\_\_, and the midpoint of the line segment is the \_\_\_\_\_ of the hyperbola.
- Each hyperbola has two \_\_\_\_\_ that intersect at the center of the hyperbola.
- The standard form of the equation of the hyperbola with center  $(h,k)$  and a vertical transverse axis is \_\_\_\_\_.

2. Sketch the graph. Identify the center, vertices, co-vertices, lengths of the transverse and conjugate axes, foci and equations of the asymptotes.

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

b)  $\frac{(y-3)^2}{9} - \frac{(x+1)^2}{16} = 1$

c)  $9y^2 - x^2 + 2x + 54y - 1 = 0$

d)  $9x^2 - y^2 + 54x + 10y + 20 = 0$

3. Find the standard form of the equation of the hyperbola with the given characteristics and center at the origin.

a) Vertices:  $(\pm 4, 0)$   
Foci:  $(\pm 6, 0)$

b) Vertices:  $(0, \pm 3)$   
Asymptotes:  $y = \pm 3x$

c) Foci:  $(\pm 10, 0)$   
Asymptotes:  $y = \pm \frac{3}{4}x$

4. Find the standard form of the equation of the hyperbola with the given characteristics.

a) Vertices:  $(2, \pm 3)$   
Foci:  $(2, \pm 6)$

b) Vertices:  $(\pm 2, 1)$   
Passes through the point  $(5, 4)$

c) Vertices:  $(3, 0), (3, 6)$   
Asymptotes:  $y = 6 - x, y = x$

# ANSWERS

1.

- a) hyperbola      b) branches      c) transverse, center      d) asymptotes

$$e) \frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

2.

a) center:  $(1, -2)$

vertices:  $(-3, -2), (5, -2)$

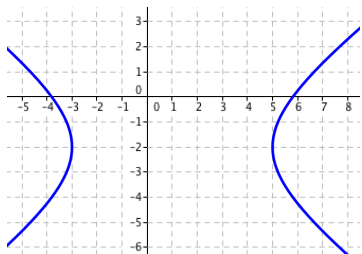
covertices:  $(1, 1), (1, -5)$

transverse axis: 8

conjugate axis: 6

foci:  $(-4, -2), (6, -2)$

asymptotes:  $y + 2 = \pm \frac{3}{4}(x - 1)$



b) center:  $(-1, 3)$

vertices:  $(-1, 6), (-1, 0)$

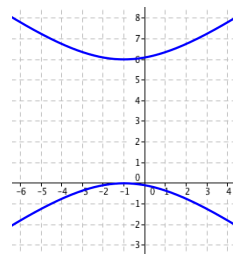
covertices:  $(-5, 3), (3, 3)$

transverse axis: 6

conjugate axis: 8

foci:  $(-1, 8), (-1, -2)$

asymptotes:  $y - 3 = \pm \frac{3}{4}(x + 1)$



c) center:  $(1, -3)$

vertices:  $(1, 0), (1, -6)$

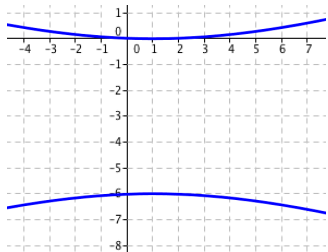
covertices:  $(10, -3), (-8, -3)$

transverse axis: 6

conjugate axis: 18

foci:  $(1, -3 \pm 3\sqrt{10})$

asymptotes:  $y + 3 = \pm \frac{1}{3}(x - 1)$



d) center:  $(-3, 5)$

vertices:  $(-5, 5), (-1, 5)$

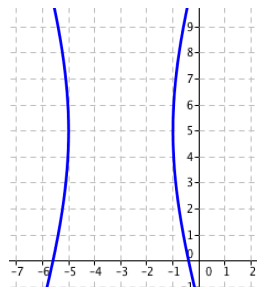
covertices:  $(-3, -1), (-3, 11)$

transverse axis: 4

conjugate axis: 12

foci:  $(-3 \pm 2\sqrt{10}, 5)$

asymptotes:  $y - 5 = \pm 3(x + 3)$



3.

a)  $\frac{x^2}{16} - \frac{y^2}{20} = 1$

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

c)  $\frac{x^2}{64} - \frac{y^2}{36} = 1$

4.

a)  $\frac{y^2}{9} - \frac{(x-2)^2}{27} = 1$

b)  $\frac{x^2}{4} - \frac{(y-1)^2}{12/7} = 1$

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