Hyperbola

Word Problems

1. Two radio towers are located at the points (8, 0) and (–8, 0) on a flat surface. A hyperbolic signal zone is formed such that for any point inside the zone, the difference between its distances to the two towers is always 10 meters. If the length of the transverse axis of the hyperbola is 10 meters, find the equation of the hyperbola.

2. A reflecting telescope uses a hyperbolic mirror with its focus points at two specific locations. The mirror is centered at (5, 2), and the length of its horizontal transverse axis is 18 inches, while the length of its conjugate axis is 24 inches. Write the coordinates of the vertices and the hyperbola equation that describes the shape of the mirror.

3. A city is planning a park with a unique hyperbolic walking path. The center of the hyperbola is located at the origin of the park's coordinate plane. The longer axis of the hyperbola, which lies horizontally, measures 48 feet, while the shorter axis measures 20 feet. To complete the path design, the planners need to determine the hyperbola equation and the location of its foci. Help them find the equation and coordinates of the foci.

4. A company is designing a satellite dish shaped like a hyperbola. The dish is not centered at the origin but at point (2, –3) on the coordinate plane. The transverse and the conjugate axis of the dish are 12 feet and 8 feet respectively. If the transverse axis is parallel to the x-axis, find the equation of the hyperbola that represents the shape of the dish and also determine the coordinates of its foci.

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Word Problems - **Answers**

MATH MONKS

1. Two radio towers are located at the points (8, 0) and (–8, 0) on a flat surface. A hyperbolic signal zone is formed such that for any point inside the zone, the difference between its distances to the two towers is always 10 meters. If the length of the transverse axis of the hyperbola is 10 meters, find the equation of the hyperbola.

$$\frac{x^2}{25} - \frac{y^2}{39}$$

2. A reflecting telescope uses a hyperbolic mirror with its focus points at two specific locations. The mirror is centered at (5, 2), and the length of its horizontal transverse axis is 18 inches, while the length of its conjugate axis is 24 inches. Write the coordinates of the vertices and the hyperbola equation that describes the shape of the mirror.

$$\frac{(x-5)^2}{81} - \frac{(y-2)^2}{144} = 1 \text{ , } (14, 2) \text{ and } (-4, 2)$$

3. A city is planning a park with a unique hyperbolic walking path. The center of the hyperbola is located at the origin of the park's coordinate plane. The longer axis of the hyperbola, which lies horizontally, measures 48 feet, while the shorter axis measures 20 feet. To complete the path design, the planners need to determine the hyperbola equation and the location of its foci. Help them find the equation and coordinates of the foci.

$$\frac{x^2}{576} - \frac{y^2}{100} = 1 \text{ , } (26, 0) \text{ and } (-26, 0)$$

4. A company is designing a satellite dish shaped like a hyperbola. The dish is not centered at the origin but at point (2, –3) on the coordinate plane. The transverse and the conjugate axis of the dish are 12 feet and 8 feet respectively. If the transverse axis is parallel to the x-axis, find the equation of the hyperbola that represents the shape of the dish and also determine the coordinates of its foci.

$$\frac{(x-2)^2}{36} + \frac{(y+3)^2}{16} = 1 \text{ , } (2 + 2\sqrt{13}, -3) \text{ and } (2 - 2\sqrt{13}, -3)$$