

Answer on Question #57414 – Math – Calculus

Question

Write the equation of each conic section with the given properties: A hyperbola with vertices $(0, -6)$ and $(0, 6)$ and asymptotes $y = 3/4x$ and $y = -3/4x$.

Solution

It is given that vertices are $(0, -6)$ and $(0, 6)$. That makes this a vertical aligned hyperbola. The center of the hyperbola is midway between the left and right vertex which makes the center equal to $(0, 0)$.

The general equation of vertical hyperbola is

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1,$$

where a is the distance between the vertex and the center, which is equal to $a=6$.

The equation for the asymptote of a vertical aligned hyperbola is

$$y = \pm \frac{a}{b} x$$

It is given that

$$\frac{a}{b} = \frac{3}{4}$$

$$\frac{6}{b} = \frac{3}{4},$$

hence $b = 8$.

The formula for this vertically aligned hyperbola is

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

Answer: $\frac{y^2}{36} - \frac{x^2}{64} = 1.$