Answer on Question # 57225 – Mathematic – Calculus

Question:

What is the length of the conjugate axis?

$$\frac{(x-2)^2}{36} - \frac{(y+1)^2}{64} = 1. \tag{1}$$

Solution:

The equation (1) describes the hyperbola with horizontal transverse axis. In general case its canonical equation has the form

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

where *(h, k)* are the coordinates of the center (fig.1).

Definition: if two points *B* and *B'* are on the y-axis such that *CB = CB' = b*, then the line segment *BB'* is called *the conjugate axis* of the hyperbola. Therefore, the length of conjugate axis is *2b*.
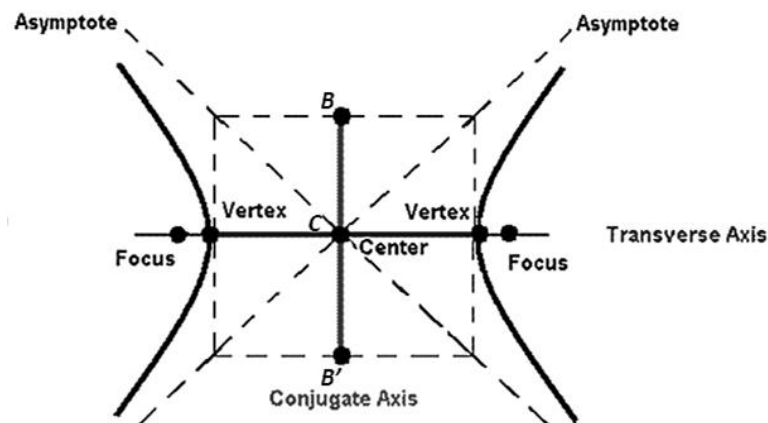

Fig.1

Let`s rewrite (1) as

$$\frac{(x-2)^2}{6^2} - \frac{(y+1)^2}{8^2} = 1. \tag{3}$$

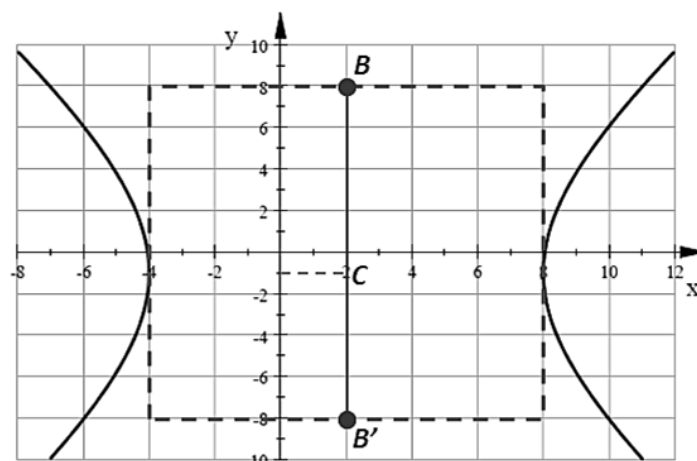As we see, the point *C (2,-1)* is the center of hyperbola (3) (fig.2), and *b=8.*

Fig.2

Therefore, the length of conjugate axis is equal *2b = 2·8=16 units*.

Answer: the length of conjugate axis is *16 units.*