Find an equation of the described hyperbola.

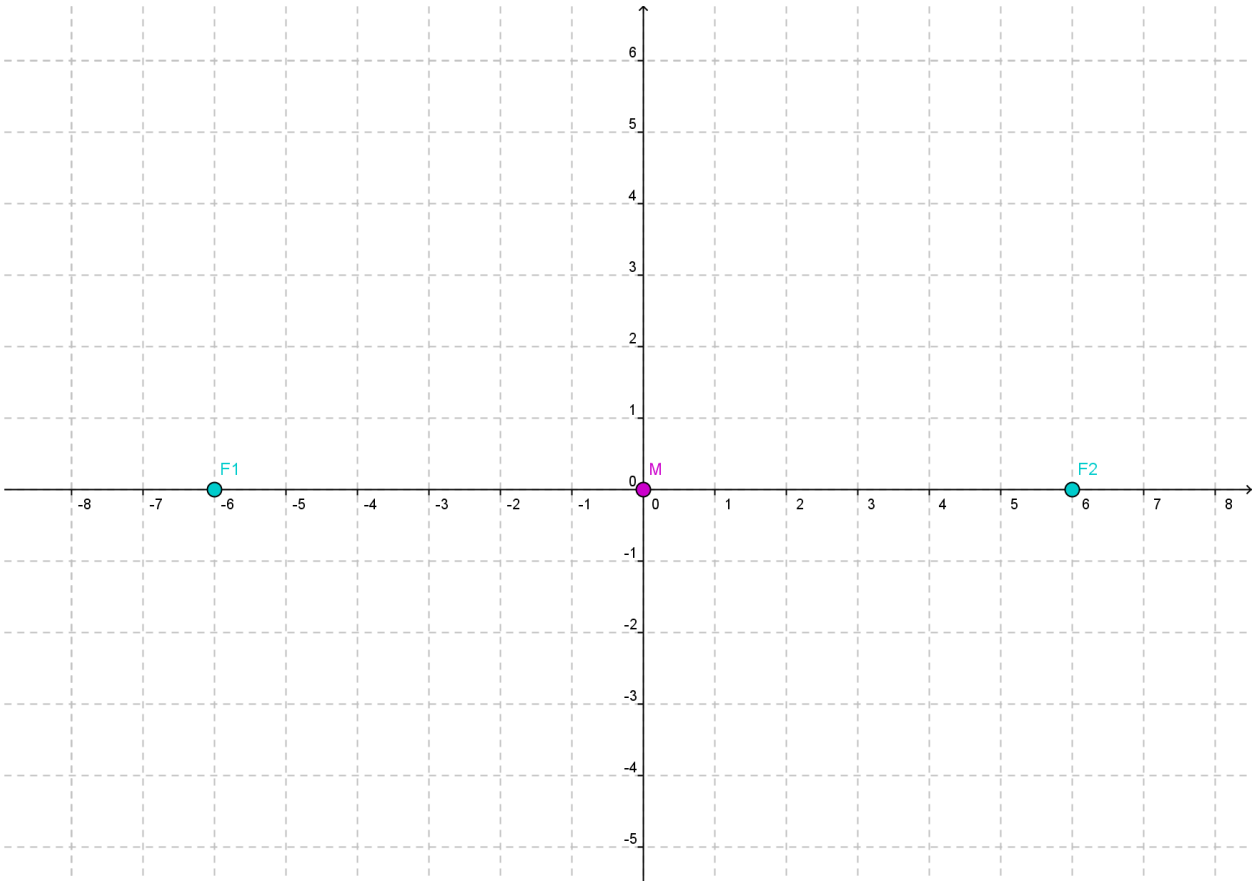
Foci: $(-6, 0)$, $(6, 0)$
Difference of Focal Radii: 8

The difference of the focal radii is a constant number (remember our activity from the first day of hyperbolas when you measured and subtracted two distances?). In fact…

Difference of Focal Radii $= 2a$

Step 1- Determine if this hyperbola is UP/DOWN or RIGHT/LEFT.

Plot the foci and the center (it is the midpoint of the segment between the foci) on a graph to determine the direction of the transverse axis.



It looks like the transverse axis is horizontal, which means this hyperbola is RIGHT/LEFT

RIGHT/LEFT hyperbola equations are in the form

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

Step 2- Use the difference of the focal radii to calculate a and a^2.

We know the difference of the focal radii $= 2a$, so…

$$8 = 2a$$
$$4 = a$$
$$\mathbf{16 = a^2}$$

Step 3- Use the center and foci on the graph to determine c and c^2.

On our graph, the foci are a distance of 6 away from the center, so…

$$c = 6$$
$$\mathbf{c^2 = 36}$$

Step 4- Use the equation $c^2 = a^2 + b^2$ to calculate b^2.

$$c^2 = a^2 + b^2$$
$$36 = 16 + b^2$$
$$\mathbf{20 = b^2}$$

Step 5- Put a^2 and b^2 in the hyperbola equation.

$$\boxed{\frac{\mathbf{x^2}}{\mathbf{16}} - \frac{\mathbf{y^2}}{\mathbf{20}} = \mathbf{1}}$$