**Question**

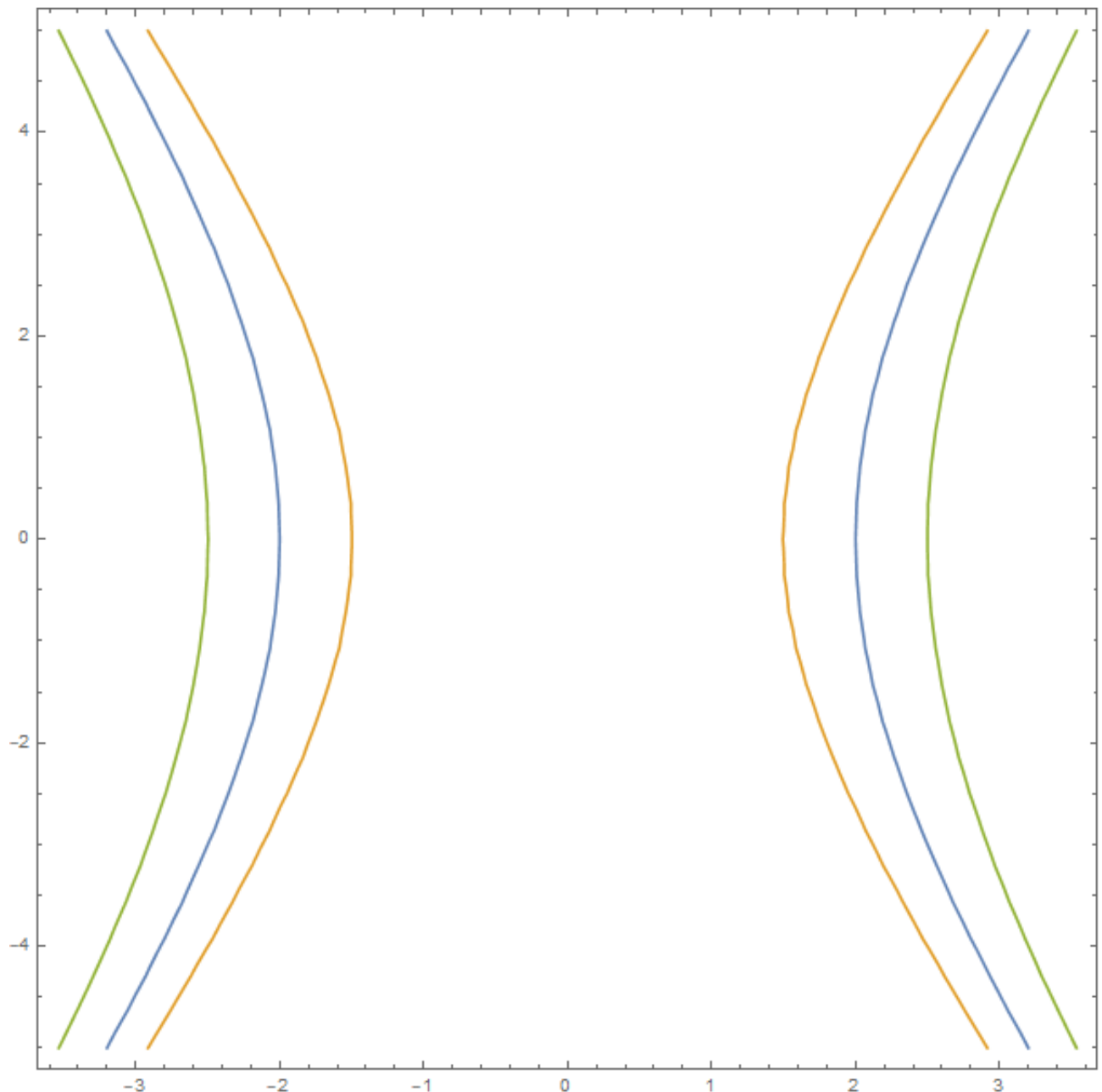Describe and draw a rough sketch of the level curves of the function f(x,y)=underroot (4x square - y square).

**Solution**

By the definition, level curves of the function $f(x, y)$ are curves where the function takes on a given constant value $c$. In this example $f(x, y) = c \geq 0$.

$$f(x, y) = c = \sqrt{4x^2 - y^2} \Rightarrow c^2 = 4x^2 - y^2 \Rightarrow \frac{x^2}{\left(\frac{c}{2}\right)^2} - \frac{y^2}{c^2} = 1$$

This is an equation of hyperbola with parameters $a = c/2$ and $b = c$.

Let's draw few curves:

Horizontal axis is x, vertical axis is y, orange is c=3, blue is c=4, green is c=5 on this picture.