7.

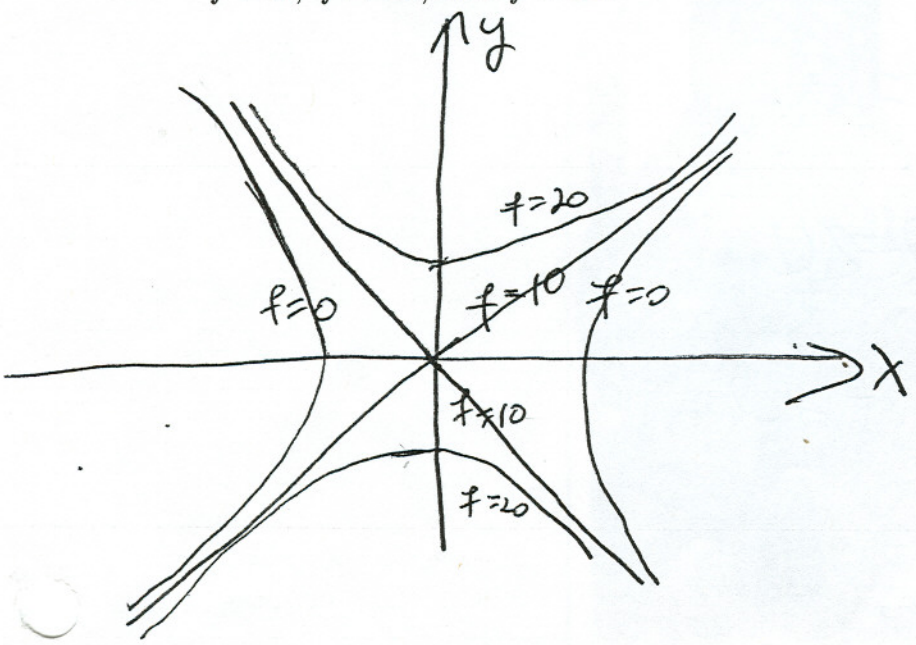
(a) Compute $\lim_{\substack{(x,y)\to(0,0)\\ \text{along the } y\text{-axis}}} \frac{x-y}{x+y} = \lim_{y\to 0} \frac{-y}{y} = \lim_{y\to 0} -1 = -1$

(b) Compute $\lim_{\substack{(x,y)\to(0,0)\\ \text{along the line } y=x}} \frac{x-y}{x+y} = \lim_{x\to 0} \frac{x-x}{x+x} = \lim_{x\to 0} \frac{0}{2x} = \lim_{x\to 0} 0 = 0$

(c) Compute $\lim_{(x,y)\to(0,0)} \frac{x-y}{x+y}$.

This limit does not exist because a and b have different answers.

8. Graph and label the level sets of $f(x,y) = 10 - x^2 + y^2$ which correspond to $f = 0$, $f = 10$, and $f = 20$.



$f=10$ is $10 = 10 - x^2 + y^2$
$x^2 = y^2$
2 straight lines

$f=0$ is $0 = 10 - x^2 + y^2$
$x^2 - y^2 = 10$
a hyperbola

$f=20$ is $20 = 10 - x^2 + y^2$
$10 = y^2 - x^2$