Limit and Continuity in 2-D.

1-D

As $x$ approaches $c$
$f(x)$ approaches $L_x$

$\forall \varepsilon > 0 \exists \delta > 0 / |x - c| < \delta \Rightarrow |f(x) - L_x| < \varepsilon$

2-D

As $(x,y)$ approaches $(c,d)$
$f(x,y)$ approaches $L$

$\forall \varepsilon > 0 \exists \delta > 0 / d((x,y),(c,d)) < \delta \Rightarrow |f(x,y) - L| < \varepsilon$

New IN 2-D

1. Many ways to approach the point
   The limit must be independent of the way we approach the point

2. Relationship with 1-D
   $\lim_{(x,y) \to (c,d)} f(x,y) \Rightarrow$ sometimes $\lim_{x \to c} \lim_{y \to d} f(x,y) \Rightarrow \lim_{y \to d} \lim_{x \to c} f(x,y)$

This gives us a tool of disproving limits:
If two different ways give different answers
$\Rightarrow$ No limit

This gives us a tool for evaluating limits in practice