Extreme Values

$f(a,b)$ is a **local maximum** value of f if $f(a,b) \geq f(x,y)$ for all domain points (x,y) in an open disk centered at (a,b).
$f(a,b)$ is a **local minimum** value of f if $f(a,b) \leq f(x,y)$ for all domain points (x,y) in an open disk centered at (a,b).

First Derivative Test

If $f(x,y)$ has a local maximum or local minimum value at an interior point (a,b) of its domain and if the first partial derivatives exist there, then $f_x(a,b) = 0$ and $f_y(a,b) = 0$

Saddle Points

This is a point where its is a local maximum in one direction and local minimum in another.

Critical Point

An interior point of the domain of a function $f(x,y)$ where both f_x and f_y are zero or both do not exist is a critical point of f.