A function of two variables has a __________ at \((a,b)\) if __________ for all points \((x,y)\) in some region around \((a,b)\).
- outside the region it is possible that the function \(\leftarrow\) __________

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A point \((a,b)\) is called a __________ of \(f\) is one of the following is true:

\(i\)

\(ii\)

\(f\) has a local maximum or local minimum at \((a,b)\) and the first partial derivatives of \(f\) exist there

\(\Rightarrow\) \(\downarrow\)

\(f\) has a local maximum or local minimum at \((a,b)\)

\(\Rightarrow\)
Find all critical points \((a,b)\) such that 
\(f_x(a,b) = 0\) and \(f_y(a,b) = 0\) 
and the ______________________ are continuous in some region around \((a,b)\) 

Let 

\[ D = \] 

Evaluate \(D\) at these critical points 

\[ D(a,b) > 0 \quad \rightarrow \quad \] 
\[ D(a,b) < 0 \quad \rightarrow \quad \] 
\[ D(a,b) = 0 \quad \rightarrow \quad \]
\[ f(x, y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 2 \]
A function of two variables has an ______________ at \((a, b)\) if ______________ for all points ______________

A function of two variables has an ______________ at \((a, b)\) if ______________ for all points ______________

Usually the domain is restricted to some region

\[ f(x, y) = x^2 + y^2 + x^2 y + 4 \]

Restricted Domain:

\[-1 \leq x \leq 1 \text{ and } -1 \leq y \leq 1 \]

A region in \(\mathbb{R}^2\) (for us this will be the \(xy\) plane)

is called ______ if it ______________.  

A region in \(\mathbb{R}^2\) (for us this will be the \(xy\) plane)

is called ______ if it is ______________

(in other words a region is ______ if it is ______)

Extreme Value Theorem

\(f(x, y)\) is ______ in some region \(S\) in \(\mathbb{R}^2\) \(\Rightarrow\) there are points \((a, b)\) and \((c, d)\) in the region \(S\) so that \(f(a, b)\) is an _______ and \(f(c, d)\) is an _______

This tells us that _______ but it doesn’t tell us _______.

2/22/2012
To find the absolute maximum and absolute minimum values of a continuous function $f$ on a closed region $S$:

1) Find all the ________ of $f$ that lie ___ the region $S$ ________ the function at __________________

2) Find all _______________ that lie on the ______. (This turns into a Calc I problem)

3) Find all the "__________" of the region and ________ the function ____________.

4) The ______ and ______ of the function values found in steps 1-3 are the _____________ value and ____________ ________________ value of the function $f$

Find the absolute maximum and absolute minimum values of $f(x, y) = x^2 + xy$ on the region $S: \{(x, y) | |x| \leq 2, |y| \leq 1\}$
Find the absolute maximum and absolute minimum values of \( f(x, y) = x^2 + xy \) on the region \( S \): \( \{(x, y) | x| \leq 2, |y| \leq 1\} \)