Reduction on the function of two variables limit line

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I explore a simple Multivariable Calculus function and problem to find relative min and max. Let p1 and p2 simply mean relatively indivisible spaces with respect to S, a surface that curves. Prove that in a function \( f(x, y) \) there can be a property of reflexive scalers to exponents that yield an integer \( N \) if \( f(x, y) = x^b - axy + ay^a \), given \( a = b + 1 \) so \( D(p1, p2) = N2 \) if \( p1 \) and \( p2 \neq N1 \)

Let \( f(x, y) = x^4 - 5xy + 5y^5 \), \( \frac{\delta f}{\delta x} = 4x^3 - 5y \), \( \frac{\delta f}{\delta y} = -5x + 25y^4 \), where \( a = 5 \), wisely chosen.

\[
\frac{\delta f}{\delta x} = 4x^3 - 5y \Rightarrow \frac{\delta^2 f}{\delta x^2} = 12x^2, \quad \frac{\delta f}{\delta y} = -5x + 25y^4 \Rightarrow \frac{\delta^2 f}{\delta y^2} = 100y^3, \quad \frac{\delta^2 f}{\delta x \delta y} = -5
\]

\( 4x^3 - 5y = 0, \quad -5x + 25y^4 = 0, \quad x = 5y^4, \quad 4(5y^4)^3 - 5y = 0 \) so \( 500y^{12} - 5y = 0, \quad y(100y^{11} - 1) = 0 \)

\( y_1 = 0, \quad y_2 = \frac{1}{100^{\frac{1}{11}}}, \quad x_1 = 5(0)^4 = 0, \quad x_2 = 5\left(\frac{1}{100^{\frac{1}{11}}}\right)^4 = \frac{5}{100^{\frac{4}{11}}} \)

\( 0, 0 = (x_1, y_1), \quad \left(\frac{5}{100^{\frac{1}{11}}}, \frac{1}{100^{\frac{1}{11}}}\right) = (x_2, y_2) \)

\[
\frac{\delta f}{\delta x} = 12x^2 \Rightarrow 12(x_1)^2 = 0, \quad 12(x_2)^2 = \frac{300}{100^{\frac{2}{11}}}
\]

\[
\frac{\delta f}{\delta y} = 100y^3 \Rightarrow 100(y_1)^3 = 0, \quad 100(y_2)^3 = \frac{100}{100^{\frac{3}{11}}}
\]

\( D(0, 0) = 0 \cdot 0 - 25, \quad -25 < 0, \quad D \left(\frac{5}{100^{\frac{1}{11}}}, \frac{1}{100^{\frac{1}{11}}}\right) = \frac{300}{100^{\frac{2}{11}}} \cdot \frac{100}{100^{\frac{3}{11}}} - 25 = 300 - 25 = 275, \quad 275 > 0 \)

Saddle point at \( (0, 0) \) and a local min \( \left(\frac{5}{100^{\frac{1}{11}}}, \frac{1}{100^{\frac{1}{11}}}\right) \)

Graph using Geogebra:

We show that this example allows proof on the following page.

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Let condition \( a = b + 1 \) then denote \( ba^2 = 100 \) so \( b(b - 1) - 1 = 11 \), a prime.

We generalize \( f(x, y) = x^b - axy + ay^a \), \( \frac{\delta f}{\delta x} = bx^{b-1} - ay \), \( \frac{\delta f}{\delta y} = -ax + a^2 y^b \)

\[
\frac{\delta f}{\delta x} = bx^{b-1} - ay \Rightarrow \frac{\delta f}{\delta x} = (b-1)bx^{b-2}, \quad \frac{\delta f}{\delta y} = -ax + a^2 y^b \Rightarrow \frac{\delta^2 f}{\delta y^2} = ba^2 y^{b-1} \Rightarrow \Rightarrow \frac{\delta^2 f}{\delta x \delta y} = -a
\]

\( bx^{b-1} - ay = 0, \ -ax + a^2 y^b = 0, \ x = ay^b, \ b(ay^b)^{b-1} - ay = 0 \) so \( ba^{b-1}y^{b(b-1)} - ay = 0, \ y(ay^b)^{b(b-1)-1} = 0 \)

\( y1 = 0, \ y2 = \frac{1}{100^{1/11}}, \ x1 = a(0)^b = 0, \ x2 = a\left(\frac{1}{100^{1/11}}\right)^b = \frac{a}{100^{b/11}} \)

\( (0, 0) = (x1, y1), \ \left(\frac{a}{100^{b/11}}, \frac{1}{100^{1/11}}\right) = (x2, y2) \)

\[
\frac{\delta^2 f}{\delta x^2} = b(b-1)x^{b-2} \Rightarrow b(b-1)(x1)^2 = 0, \ b(b-1)(x2)^2 = \frac{(b-1)100}{100^{20/11}}
\]

\[
\frac{\delta^2 f}{\delta y^2} = 100y^3 \Rightarrow 100(y1)^3 = 0, \ 100(y2)^{a^2} = \frac{1}{100^{60-20/11}}
\]

\[D(0, 0) = 0 \cdot 0 - a^2, \ -a^2 < 0, \ D\left(\frac{a}{100^{b/11}}, \frac{1}{100^{1/11}}\right) = \frac{100(b-1)}{100^{b^{b/11}-1/11}} \cdot \frac{100}{100^{b^{b/11}+b/11}} - a^2 = 100(b - 1) - a^2 = N, \ N > 0
\]

Saddle point at \( (0, 0) \) and a local min \( \left(\frac{a}{100^{b/11}}, \frac{1}{100^{1/11}}\right) \)

Forms reduce by \( a - b \) to reform \( x - y \) by logic:

Unique \( p1 \) and \( p2 \) allow \( N \) since a denominator can be split at a differentiable proportion of a unit value 1.

Thus able to be scaled at 1 by 1, reflexively. Thus reproofing this known property asymptotically.

This does not however preclude the function to not balance when analyzed at a point other than its saddle.

So by the vertex rule this function is steady and allows the two manifold and double point operator to allow and find minimal tolerance and thus a good vantage point to build more complex functions.

By the property \( b(b - 1) - 1 = 11 \), the function can sit on the given prime space. So values curve in the same direction as seen in the given graphs. A min. space \( S \) will always retain its geometry on this limit.

If \( P \) is the collection of prime spaces then \( R \) is a real valued function that denotes \( Q \) or \( S \) to be Integers at least once in ratio before \( Q \) and \( S \) converge asymptotically as if \( S \) holds the space \( D(p1,p2) \) so \( Q \) validates the arc if the boundary points are non negative, which they are not at least one point so symmetrically we have shown this. The limit line never converges fully due to minimal curvature.