

EXTREMES OF TWO VARIABLES

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EPM 2 GROUP III

$$f(x,y) = 1 - \sqrt{x^2 + y^2}$$

I PARTIAL DERIVATIVES

$$\frac{\partial f}{\partial x} = \frac{-x}{\sqrt{x^2 + y^2}}$$

$$\frac{\partial^2 f}{\partial x^2} = \frac{x^2}{(x^2 + y^2)^{3/2}} - \frac{1}{\sqrt{x^2 + y^2}}$$

$$\frac{\partial f}{\partial y} = \frac{-y}{\sqrt{x^2 + y^2}}$$

$$\frac{\partial^2 f}{\partial y^2} = \frac{y^2}{(x^2 + y^2)^{3/2}} - \frac{1}{\sqrt{x^2 + y^2}}$$

$$\frac{\partial^2 f}{\partial x \partial y} = 0$$

II CRITICAL POINTS

$$\begin{cases} \frac{-x}{\sqrt{x^2 + y^2}} = 0 & x = 0 \\ \frac{-y}{\sqrt{x^2 + y^2}} = 0 & y = 0 \end{cases}$$

I CAN ONLY SUSPECT THAT THERE'S A MINIMUM, MAXIMUM OR A SADDLE POINT IN $(0,0,1)$

$$p_1(0,0) \in D_f$$

INDEED, THE VALUE OF $\sqrt{x^2 + y^2}$ IS LOWEST FOR $(x,y) = (0,0)$, SO $1 - \sqrt{x^2 + y^2}$ HAS A MAXIMUM IN $(0,0,1)$

ANSWER

$$F_{\text{MAX}} \text{ IN } p_1(0,0)$$

$$F_{\text{MAX}} = 1$$



plot $1 - ((x^2 + y^2)^{1/2})$ from $x = -0.01$ to 0.01 , from $y = -0.01$ to 0.01

Input interpretation:

plot $1 - \sqrt{x^2 + y^2}$ $x = -0.01$ to 0.01
 $y = -0.01$ to 0.01

3D plot:

