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$$f(x, y) = x^2 + y^2$$

$$\frac{\partial f}{\partial x} = 2x$$

$$y = \text{const.}$$

$$\frac{\partial f}{\partial y} = 2y$$

$$x = \text{const.}$$

$$\frac{\partial^2 f}{\partial x^2} = (2x)'_x = 2$$

$$\frac{\partial^2 f}{\partial y^2} = (2y)'_y = 2$$

$$\frac{\partial^2 f}{\partial x \partial y} = (2y)'_x = 0$$

$$2x = 0 \Rightarrow x = 0$$

$$2y = 0 \Rightarrow y = 0$$

$$P_1 = [0, 0]$$

$$D_f = \begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix} = 4 - 0 = 4$$

$$D_f(0, 0) = 4 > 0$$

$$(2) \Big|_{(0,0)} = 2 > 0 \quad \text{MIN}$$

Answer:

$$f_{\min}(0, 0) = 0^2 + 0^2 = 0$$

 **WolframAlpha**™ computational...
knowledge engine

plot $x^2 + y^2$, $x = -0.1..0.1$, $y = -0.1..0.1$

Input interpretation:

plot

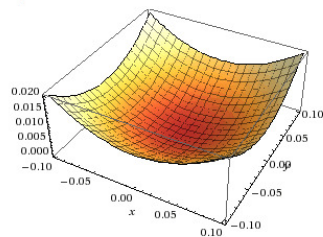
$x^2 + y^2$

$x = -0.1$ to 0.1

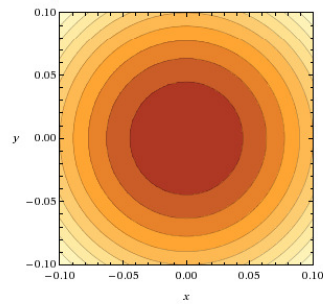
$y = -0.1$ to 0.1

3D plot:

Show contour lines



Contour plot:



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