

$$\text{Let } f(x, y) = x^2 - y^2$$

1. Find the first order partial derivatives f_x , f_y
2. Find the second order partial derivatives f_{xx} , f_{xy} , f_{yx} , and f_{yy}
3. Evaluate f_x , f_y , f_{xx} and f_{yy} the point $(2, 1)$.
4. What does your answer to 3 tell you about the graph $z = f(x, y)$ at $(2, 1)$?
5. Use a contour plot and/or 3D plot in Mathematica to verify your answers

Let $f(x, y) = x^2 - 8x + 2xy - 14y + 4y^2 + 19$

1. Find the first order partial derivatives f_x , f_y
2. Find the second order partial derivatives f_{xx} , f_{xy} , f_{yx} , and f_{yy}
3. Evaluate f_x , f_y , f_{xx} and f_{yy} the point $(3, 1)$.
4. What does your answer to 3 tell you about the graph $z = f(x, y)$ at $(3, 1)$?
5. Use a contour plot and/or 3D plot in Mathematica to verify your answers