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

1. Find the first order partial derivatives g_x, g_y

2. Find the second order partial derivatives g_{xx}, g_{xy}, g_{yx}, and g_{yy}

3. Evaluate g_x, g_y, g_{xx} and g_{yy} the point $(3, 1)$.

4. What does your answer to 3 tell you about the graph $z = g(x, y)$ at $(3, 1)$?

5. Use a contour plot and/or 3D plot in Mathematica to verify your answers