

Let $g(x, y) = x^2 - 4x + y^2 - 8y + xy + 20$.

1. Find g_x and g_y .
2. Evaluate $g_x(3, 4)$ and $g_y(3, 4)$.
3. On the same set of axes, plot $z = g(x, y)$ and the paths on the surface corresponding to $x = 3$ and $y = 4$.
Are your answers from #2 consistent with the graph?
4. At what point (x_0, y_0) does $z = g(x, y)$ obtain its minimum value?
Verify your answer using a contour plot of $g(x, y)$.