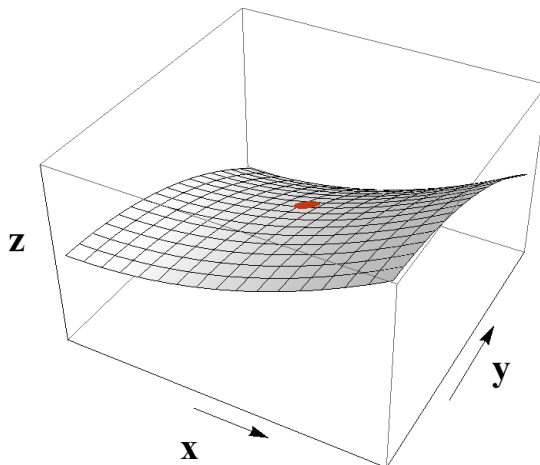


Discovery Exercise for Partial Derivatives

The drawing below shows a function $z(x, y)$, with one point on the plot marked.



1. If you start at the marked point and move in the positive x direction, holding y constant, is z increasing, decreasing, or staying constant?
2. If you start at the marked point and move in the positive y direction, holding x constant, is z increasing, decreasing, or staying constant?

The rate of change of z in the x direction, holding y constant, is “the derivative of z with respect to x ,” usually written $\partial z / \partial x$.

3. Based on your answers above, is $\partial z / \partial x$ positive, negative, or zero at the marked point?

See Check Yourself #19 at felderbooks.com/checkyourself

4. What about $\partial z / \partial y$?
5. Looking at the plot, is $\partial^2 z / \partial x^2$ at the marked point positive, negative, or zero? Explain what about the surface lets you know.
6. Suppose that z represents the concentration of salt in a lake, y represents depth in that lake, and x represents time. Explain what each of your answers to Parts 3–5 tells you physically about the lake.