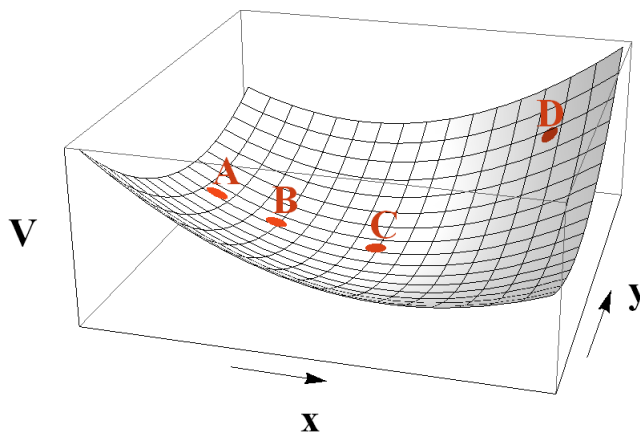


Discovery Exercise for Going from Potential to Gradient

You have seen in one dimension how a potential function predicts motion: every object is pushed from high potential towards low potential. Now consider the graph below in which the x and y axes represent position in a plane, and the vertical axis represents the potential at each point (x, y) .



Just as in 1D, you can imagine the potential as a hill with a ball rolling on it. The ball will be pulled in the downhill direction, and the steeper the slope the more it will accelerate. For the problems below you don't need to calculate any numbers; you should be able to see the answers from the plot.

1. If a ball were at rest at location A , would it roll in the positive x direction, the negative x direction, or neither? Would it roll in the positive y direction, the negative y direction, or neither? (Remember that this entire plot takes place in a two-dimensional universe; there is no z direction because the vertical axis represents the potential $V(x, y)$.)

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2. Repeat Part 1 for balls that begin at rest at locations B , C , and D .
3. Which ball will accelerate faster, ball A or ball B ?
4. Now, answer with a brief equation (no words required): what must be true of the function $V(x, y)$ at a given point for a ball to feel a pull in the positive x direction?