Warm-up: Imagine you are standing on the side of a tall hill. List three things you would want to know about your position.
On your Mark: Place your surface on the grid. Label the x and y directions on the grid and surface. Measure the slope *in the direction of greatest increase* of the surface at the blue dot. Include units.

Slope in steepest direction: _____

Get Set: The surface's height h is a function of x and y, giving $h = h(x, y)$. At the blue dot, measure both $\frac{\partial h}{\partial x}$ and $\frac{\partial h}{\partial y}$. Then form the vector $\frac{\partial h}{\partial x}\,\hat{\boldsymbol{x}} + \frac{\partial h}{\partial y}\,\hat{\boldsymbol{y}}$. Include units.

$\frac{\partial h}{\partial x} =$ _____ $\frac{\partial h}{\partial y} =$ _____ $\frac{\partial h}{\partial x}\,\hat{\boldsymbol{x}} + \frac{\partial h}{\partial y}\,\hat{\boldsymbol{y}} =$ _____ $\hat{\boldsymbol{x}} +$ _____ $\hat{\boldsymbol{y}}$

Go: At the blue dot, which way does your vector $\frac{\partial h}{\partial x}\,\hat{\boldsymbol{x}} + \frac{\partial h}{\partial y}\,\hat{\boldsymbol{y}}$ point on the surface?

1. What is your vector's magnitude?
2. How does your vector relate to the level curve through the blue dot?

Challenge: Rotate the surface 30° on the grid and redraw the x and y directions on your surface. Which of your answers to **On your Mark**, **Get Set**, and **Go** remain the same?

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