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: The surface represents the hill's height h. If x and y (and h) are measured in feet, measure the *steepest* slope possible at the blue dot. Include units.

Steepest slope: _____

Get Set: Measure $\frac{\partial h}{\partial x}$ and $\frac{\partial h}{\partial y}$ at the blue dot. 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: Find the magnitude of $\frac{\partial h}{\partial x}\,\hat{\boldsymbol{x}} + \frac{\partial h}{\partial y}\,\hat{\boldsymbol{y}}$.

Challenge: Rotate the surface some amount on the grid. Redraw the x and y directions extending through the blue dot, and redo **On your Mark**, **Get Set**, and **Go**. Did anything change? Stay the same? Why?

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