Name: _____   Surface Color: _____

Task Master: _____   Cynic: _____   Recorder: _____

The Hillside

Working in small groups (3 or 4 people), solve as many of the problems below as possible. Try to resolve questions within the group before asking for help. Each group member should then write up solutions in their own words; please do not use this sheet for that purpose, but **please turn in this sheet as well.** *Show your work! Explain why your answers work.*

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 $\frac{\partial h}{\partial x}\,\hat{\imath} + \frac{\partial h}{\partial y}\,\hat{\jmath}$. Include units.

$\frac{\partial h}{\partial x} = $ _____ $\frac{\partial h}{\partial y} = $ _____ $\frac{\partial h}{\partial x}\hat{\imath} + \frac{\partial h}{\partial y}\hat{\jmath} = $ _____ $\hat{\imath} + $ _____ $\hat{\jmath}$

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

(2) What is your vector's magnitude?

(3) 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?