

Recorder: _____

Task Master: _____ Cynic: _____ Other: _____

THE VALLEY

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. The Recorder is responsible for writing up the group's results and turning it in. Show your work! Full credit will only be given if your answer is supported by calculations and/or explanations as appropriate.

You are in a valley whose height is given by $h = ax^2 + ay^2$ where where $a = \frac{1}{10} \frac{\text{ft}}{\text{mi}^2}$. Your location corresponds to $x = y = 1$ mi. Your goal is to reach the road located at $y = 0$.

- Choose *one* of the following paths, and sketch it on your map.
I: $\{x^2 + y^2 = 2\}$ **II:** $y = x$ **III:** $y = x^2$ **IV:** $(y - 1) = 3(x - 1)$ **V:** $x = 1$
- Determine $\vec{\nabla}h$ at your location.
- Find $\int \vec{\nabla}h \cdot d\vec{r}$ along your path.
- Compute $\int dh$ along your path.
- Compare your answers to these two integrals. What do your answers represent?
Is there an easier way to get the same answer?

