

You are in a valley whose height is given by $h = ax^2 + ay^2$ where $a = \frac{1}{10} \frac{\text{ft}}{\text{mi}^2}$.

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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.

$$\text{I: } x^2 + y^2 = 2 \quad \text{II: } y = x \quad \text{III: } y = x^2 \quad \text{IV: } (y - 1) = 3(x - 1) \quad \text{V: } x = 1$$

- Determine $\vec{\nabla}h$ at your location.
- Calculate $\int_C \vec{\nabla}h \cdot d\vec{r}$ along your path.
- Compute $\int_C dh$ 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?