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.

  I: $x^2 + y^2 = 2$ **II:** $y = x$ **III:** $y = x^2$ **IV:** $(y-1) = 3(x-1)$ **V:** $x = 1$

- Determine $\vec{\boldsymbol{\nabla}} h$ at your location.
- Calculate $\oint_C \vec{\boldsymbol{\nabla}} h \cdot d\vec{\boldsymbol{r}}$ 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?