Hill Climbing Robot System Specifications

State: $\begin{bmatrix} x \\ y \end{bmatrix}$

Control: $\begin{bmatrix} u \\ \theta \end{bmatrix}$

System Dynamics:
Hill Terrain: $h(x, y) = 3y + \sin(x + xy)$

$$\theta_{heading} = \theta + \arctan\left(\frac{\partial h/\partial y}{\partial h/\partial x}\right)$$

$$\Delta h = h\left(x + cos\theta_{heading}, y + cos\theta_{heading}\right) - h(x, y)$$

$$\begin{bmatrix} \dot{x} \\ \dot{y} \end{bmatrix} = \begin{bmatrix} u \cdot \frac{cos\theta_{heading}}{\sqrt{1 + \Delta h^2}} \\ u \cdot \frac{sin\theta_{heading}}{\sqrt{1 + \Delta h^2}} \end{bmatrix}$$