



The Mars surface on which "opportunity" drives has the height  $f(x, y) = x + (2x^2 + 3y^2 - xy)$ . The rover moves along the path  $\vec{r}(t) = \langle (1 + t), \sin(t) \rangle$ .

Find the rate of change of the height  $\frac{d}{dt}f(\vec{r}(t))$  at the point  $t = 0$  by differentiating the function  $t \mapsto f(\vec{r}(t))$ .

Find the rate of change of the height  $\frac{d}{dt}f(\vec{r}(t))$  at the point  $t = 0$  using the chain rule.