Answer on Question #86460 – Math – Calculus

Question

The height of a hill is defined by the scalar field h(x, y) = 10(2xy − 3x2 + 4y2 −18x + 28y +12) . Calculate the height of the hill at the point (1,1) and the direction of the steepest ascent at that point.

Solution

The height of the hill at the point (1,1) is given by

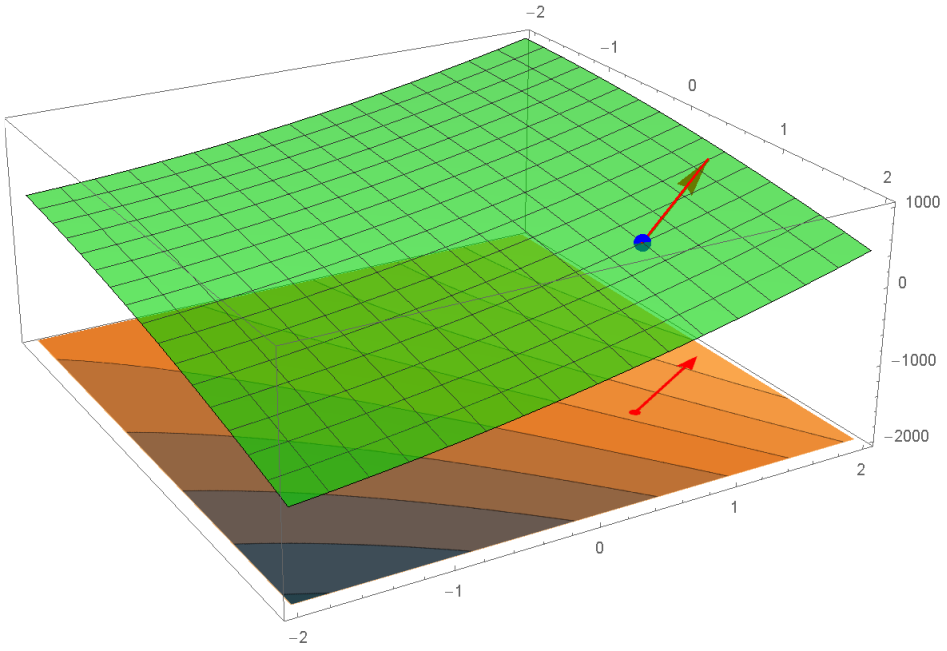
$$h(1,1) = 10 \cdot (2 \cdot 1 \cdot 1 - 3 \cdot 1^2 + 4 \cdot 1^2 - 18 \cdot 1 + 28 \cdot 1 + 12) = 250$$

The direction of the steepest ascent of h(x,y) at (x_0,y_0) is given by $\nabla h(x_0, y_0)$:

$$\frac{\partial h}{\partial x} = 10 \cdot (2y - 6x - 18)$$

$$\frac{\partial h}{\partial y} = 10 \cdot (2x + 8y + 28)$$

$$\nabla h(1,1) = \left(\frac{\partial h(1,1)}{\partial x}, \frac{\partial h(1,1)}{\partial y}\right) = (-220,380)$$



Answer: $h(1,1) = 250,\ \nabla h(1,1) = (-220,380).$