ASSIGNMENT 5 RAFAEL VILLASMIL

PROBLEM 14.8

$f(x,y) = -8x + x^2 + 12y + 4y^2 - 2xy$

DO ONE ITERATION OF OPTIMAL GRADIENT

STARTING A $x=0$ $y=0$

$\frac{\partial f}{\partial x} = -8 + 2x - 2y = -8 + 2 \times 0 - 2 \times 0 = \boxed{-8}$

$\frac{\partial f}{\partial y} = 12 + 8y - 2x = 12 + 8 \times 0 - 2 \times 0 = \boxed{12}$

$H_x = 0 - 8h = -8h$ x

$H_y = 0 + 12h = 12h$ y

$f(x,y) = -8(-8h) + (-8h)^2 + 12(12h) + 4(12h)^2 - 2(-8h)(12h)$

$f(x,y) = 64h + 64h^2 + 144h + 576h^2 - 192h^2$

$f(x,y) = 208h + 448h^2 = g(h) \Rightarrow$

$g'(h) = 208 + 896h$

@ $g'(h) = 0 = 208 + 896h \Rightarrow h = 0.2321$

$$\boxed{\begin{array}{l} x = 0 - 8(0.2321) = 1.857 \\ y = 0 + 12(0.2321) = -2.7857 \end{array}}$$

$f(x,y)$ MINIMUM $= (1.857, -2.786)$

$$\boxed{\begin{array}{l} \text{CHECK } f(0,0) = 0 \\ f(1.857, -2.786) = -3.44 \end{array}}$$

ASSIGNMENT 5   PART 2

PROVE THE ~~EX~~ EXPRESSION FOR 2nd ORDER DERIVATIVE

$\frac{d^2 f}{dx dy}$? $\frac{d^2 f}{dx dy} = \frac{d^2 f}{dy dx}$

$f(x,y) = -8x + x^2 + 12y + 4y^2 - 2xy \Rightarrow$

$\frac{f'_{x,y}}{dx} = -8 + 2x - 2y \Rightarrow$ | $\frac{f'(x,y)}{dy} = 12 + 8y - 2x \Rightarrow$

$\frac{f''_{x,y}}{dx dy} = -2$ | $\frac{f''(x,y)}{dy dx} = -2$

$$\boxed{\frac{f''_{xy}}{dx dy} = -2 = \frac{f''_{xy}}{dy dx}}$$