Exercise2.7

Luqing Ye*

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Exercise. *Suppose* $f(x,y) = x^2y^3$.*Compute the slope of the line tangent to* $f(x,y)$,*at the point* $(2,1)$,*in the direction* $\langle \frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2} \rangle$.

Solve. Let $g(t) = f(2 + \frac{\sqrt{2}}{2}t, 1 - \frac{\sqrt{2}}{2}t)$.

$$\begin{aligned} g'(t) &= \frac{\sqrt{2}}{2}\frac{\partial f}{\partial x}(2,1) - \frac{\sqrt{2}}{2}\frac{\partial f}{\partial y}(2,1) \\ &= \frac{\sqrt{2}}{2} \times 4 - \frac{\sqrt{2}}{2} \times 12 \\ &= -4\sqrt{2}. \end{aligned}$$

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*An undergraduate at Hangzhou Normal University,Email:yeluqingmathematics@gmail.com