Date

Quiz 8

Q1. $f(x,y,z)=xy^2z^3$ at $(2,1,1)$ direction $(2,-1,-1)$

Answer:

$$\nabla f=(y^2z^3,\ 2y\cdot xz^3,\ xy^2\cdot 3z^2)$$

$$|(2,-1,-1)|=\sqrt{6}$$

$$u=(2,-1,-1)\cdot\frac{1}{\sqrt{6}}=\frac{2\sqrt{6},-\sqrt{6},\sqrt{6}}{6}$$

$$u\cdot\nabla f(2,1,1)=\left(\frac{2\sqrt{6}}{6},-\frac{\sqrt{6}}{6},-\frac{\sqrt{6}}{6}\right)\cdot(1,4,6)$$

$$=\frac{\sqrt{6}}{3}+\left(-\frac{2\sqrt{6}}{3}\right)+(-\sqrt{6})$$

$$=-\frac{\sqrt{6}}{3}-\sqrt{6}$$

Q2. $f(x,y)=x^2+y^3$ $(2,1)$

$$\nabla f=(2x,\ 3y^2)$$

$$\nabla f=(4,3)$$

$$|(4,3)|=\sqrt{4^2+3^2}=5$$

∴the maximum rate of change is 5.