第五章限时练习答案

一，选择题

1-5　BBBAD　6—10DBCBD

二，填空题

1， $\frac{1}{2e}$　**2，** $e^{\sin xy}\cdot\cos xy(ydx+xdy)$　**3,** 0　**4，** $\frac{yz}{e^z-xy}$　**5，** -5

三，计算题

1， 解：$\frac{\partial z}{\partial x}=\frac{e^x}{e^x+e^y}$　$\frac{\partial z}{\partial y}=\frac{e^y}{e^x+e^y}$

$$\frac{\partial^2 z}{\partial x^2}=\frac{e^{x+y}}{(e^x+e^y)^2}\qquad \frac{\partial^2 z}{\partial y^2}=\frac{e^{x+y}}{(e^x+e^y)^2}$$

$$\frac{\partial^2 z}{\partial y\partial x}=\frac{\partial^2 z}{\partial x\partial y}=\frac{-e^{x+y}}{(e^x+e^y)^2}$$

2， 解：令 $u=x^2-e^y$　$v=\frac{x}{y}$

$$\therefore\frac{\partial z}{\partial x}=f'_u\cdot 2x+f'_v\cdot\frac{1}{y}$$

$$\frac{\partial z}{\partial y}=f'_u\cdot(-e^y)+f'_v\cdot(-\frac{x}{y^2})$$

$$\frac{\partial^2 z}{\partial x\partial y}=-[f''_{uu}\cdot 2xe^y+f''_{uv}\cdot\frac{2x^2+ye^y}{y^2}+f''_{vv}\cdot\frac{x}{y^3}+f'_v\cdot\frac{1}{y^2}]$$

3， 解：

令 $F(x,y,z)=xyz-e^z$

$$\therefore\frac{\partial z}{\partial x}=-\frac{F'_x}{F'_z}=\frac{yz}{e^z-xy}\qquad \frac{\partial z}{\partial y}=-\frac{F'_y}{F'_z}=\frac{xz}{e^z-xy}$$

$$\frac{\partial^2 z}{\partial x\partial y}=\frac{\partial(\frac{\partial z}{\partial x})}{\partial y}=\frac{\partial(\frac{yz}{e^z-xy})}{\partial y}=\frac{z}{e^z-xy}+\frac{2xyz}{(e^z-xy)^2}-\frac{e^z xyz^2}{(e^z-xy)^3}$$

4，解：

$$令F(x,y,z)=e^z-z+xy-4$$

$$\therefore \vec{n}=\vec{s}=\{F'_x,F'_y,F'_z\}\Big|_{(1,3,0)}=\{y,x,e^z-1\}\Big|_{(1,3,0)}=\{3,1,0\}$$

$$\therefore 直线方程为:\frac{x-1}{3}=\frac{y-3}{1}=\frac{z}{0}$$

$$平面方程为:3x+y-6=0$$

5 解：

$$令L(x,y,\lambda)=x-2y+\lambda(x^2+y^2-1)$$

$$\therefore \begin{cases} L'_x=0\Rightarrow \quad 1+2x\lambda=0 \\ L'_y=0\Rightarrow \quad -2+2y\lambda=0 \\ L'_\lambda=0\Rightarrow \quad x^2+y^2=1 \end{cases}$$

$$\therefore 极值点为:(\frac{\sqrt{5}}{5},-\frac{2\sqrt{5}}{5})与(-\frac{\sqrt{5}}{5},\frac{2\sqrt{5}}{5})$$

则极值为：$z_{极大值}=\sqrt{5},z_{极小值}=-\sqrt{5}$