学院　　专业、班　　年级　　学号　　姓名　　考试教室

公平竞争、诚实守信、严肃考纪、拒绝作弊

密　封　线

重庆大学《Multivariable Calculus》课程

◉ A卷
○ B卷

2017 — 2018 学年 第 1 学期

开课学院：数统学院 课程号：MATH20083　　考试日期：2017 12 15

考试方式：○开卷 ◉闭卷 ○其他　　考试时间：120 分钟

题 号	一	二	三	四	五	六	七	八	九	十	总 分
得 分											

考试提示

1.严禁随身携带通讯工具等电子设备参加考试；

2.考试作弊，留校察看，毕业当年不授学位；请人代考、替他人考试、两次及以上作弊等，属严重作弊，开除学籍。

一、(15pts.) Fill in the blanks with correct answers.

1. The curvature of the parabola y=x^2 at (0,0) is ______.

2. The area of the surface $\begin{cases} x^2+y^2=4 \\ 0\le z\le 1\end{cases}$ is _______.

3. $\iint_D xdA$=_______, where D is the region in the first quadrant that lies between the circles $x^2+y^2=4$ and $x^2+y^2=2x$.

4. $\int_C \nabla f\cdot d\vec{r}$=______, where C is a simple closed path and f is a smooth function with 2 variables.

5. Curl$\vec{F}$=___________, where $\vec{F}(x,y,z)=xz\vec{i}+xyz\vec{j}-y^2\vec{k}$.

二、(15pts.) Determine whether the following statements are true or false.

1. If curl$\vec{F}$=0 for a smooth 3-dimensional vector field $\vec{F}$, then it must be conservative. ( )

2. The two mixed second order partial derivatives for z=f(x,y) must be equal. ( )

3. Suppose D is a 2-dimensional simple bounded plane region, then $\iint_D 1dA=\int_{\partial D} xdy=-\int_{\partial D} ydx$. ( )

4. If the two partial derivatives f_x and f_y at (x_0,y_0) exist, then f(x,y) must be continuous at this point. ( )

5. Given two vectors $\alpha=(a_1,\dots,a_n),\beta=(b_1,\dots,b_n)$, then they are orthogonal if and only if $\sum_{i=1}^n a_ib_i=0$. ( )

三、(10pts.)

Suppose f(x,y)=$\begin{cases}(x^2+y^2)\cos\frac{1}{\sqrt{x^2+y^2}} & (x,y)\neq(0,0)\\ 0 & (x,y)=(0,0)\end{cases}$,

1) Is f(x,y) continuous at (0,0)?

命题人：李智强

组题人：黄辉斥

审题人：秦越石

命题时间：2017 12 01

教务处制

2) Find $\boldsymbol{f_x(0,0)}$ ***and*** $\boldsymbol{f_y(0,0)}$

3) Is f(x,y) differentiable at (0,0)?

四、(10pts.) 1) Assume f(x,y,z)=$\sqrt[z]{\frac{x}{y}}$, find the total differential of f at (1,1,1)

2) F(x,y,z)=$\boldsymbol{x^3+y^3+z^3+6xyz-1}$=0 defines implicitly a function z=f(x,y), find $\frac{\partial z}{\partial x},\frac{\partial z}{\partial y}$.

五、(10pts.) Suppose f(x,y)=$\left(y+\frac{x^3}{3}\right)\boldsymbol{e^{x+y}}$, find the maximal and minimal values of f(x,y).

六、(10pts.) Use the Divergence theorem to evaluate $\iint_S \boldsymbol{\vec{F}\cdot d\vec{S}}$, where $\boldsymbol{\vec{F}(x,y,z)=3xy^2\vec{\imath}+(xe^z)\vec{\jmath}+z^3\vec{k}}$, and S is the surface of the region bounded by $\boldsymbol{y^2+z^2=1}$ and x=−1, x=2.

七、(30pts.) Suppose $\boldsymbol{\vec{F}(x,y)=\frac{-y}{x^2+y^2}\vec{\imath}+\frac{x}{x^2+y^2}\vec{\jmath}}$=P$\boldsymbol{\vec{\imath}+Q\vec{\jmath}}$.

1) (5pts.) Find the domain D of this vector field, and show that $\frac{\partial P}{\partial y}=\frac{\partial Q}{\partial x}$ for all points in the domain D of this vector field.

2)(5pts.) Calculate $\int_C \vec{F}\cdot d\vec{r}$, where C is any positive oriented simple closed path which doesn't enclose the origin.

3)(8pts.) Calculate $\int_C \vec{F}\cdot d\vec{r}$, where C is any positive oriented simple closed path which enclose the origin.

4)(7pts.) Prove that $\int_C \vec{F}\cdot d\vec{r}$ is not independent of paths in the domain D by showing that this line integral differs along two different paths in D.

5)(5pts.) Is $\vec{F}(x,y)$ conservative on D? On what kind of regions is $\vec{F}(x,y)$ conservative?