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

◉ A卷 ○ B卷

2019 — 2020 学年 第 1 学期

开课学院：数统学院 课程号：MATH20083 考试日期：2019 12 20

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. (1,1,1,)×(1,1,1,)= ______.

2. $\lim\limits_{(x,y)\to(0,0)} \frac{x^2+y^2}{|x|+|y|}$ =________.

3. The area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is _______,

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 $\vec{F}(x,y,z)$ is a conservative vector field with continuous second order partial derivatives.

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

1. $\int_{-C} f(x,y)ds = -\int_C f(x,y)ds$. ( )

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

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 all directional derivatives of f(x,y) at (x_0,y_0) exist, then f(x,y) must be continuous at this point. ( )

5. Given two non-zero 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、(15pts.)

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)?

2) Find $f_x(0,0)$ and $f_y(0,0)$

命题人：李智强 组题人：黄辉斥 审题人：秦越石 命题时间：2019 12 01 教务处制

3）Is f(x,y) differentiable at (0,0)?

四、(10pts.) Assume the straight line $\begin{cases} \boldsymbol{x+y+b=0} \\ \boldsymbol{x+ay-z-3=0} \end{cases}$ lies in the plane $\boldsymbol{\Pi}$, and this plane is tangent to $\boldsymbol{z=x^2+y^2}$ at (1, -2, 5), find a and b.

五、(10pts.) Find extreme values of z=z(x,y), where z is given by the equation $\boldsymbol{x^2+y^2+z^2-2x+2y-4z-10=0}$.

六、（15pts.）Evaluate $\iint_S \boldsymbol{2x^3dydz+2y^3dzdx+3(z^2-1)dxdy}$, where S is the surface $\boldsymbol{z=1-x^2-y^2}$ with upwards direction.

七、（10pts.）Suppose $\vec{\boldsymbol{F}}(\boldsymbol{x},\boldsymbol{y})=\frac{-y}{x^2+y^2}\vec{\boldsymbol{i}}+\frac{x}{x^2+y^2}\vec{\boldsymbol{j}}$=P$\vec{\boldsymbol{i}}+\boldsymbol{Q}\vec{\boldsymbol{j}}$. Prove that $\int_C \vec{\boldsymbol{F}}\cdot \boldsymbol{d}\vec{\boldsymbol{r}}$ is a constant for any simple closed smooth curve C which encloses the origin, with counter clockwise direction.

八、(10pts.) Assume D={(x, y)| $x^2 + y^2 \leq 4, x \geq 0, y \geq 0$}, f(x) is a continuous positive function everywhere, and a, b are given constants, find the double integral $\iint_D \frac{a\sqrt{f(x)}+b\sqrt{f(y)}}{\sqrt{f(x)}+\sqrt{f(y)}}dA$, show your reasons.