MA 271: Several Variable Calculus

EXAM II

Nov. 2, 2017

NAME _____ Class Meet Time _____

NO CALCULATORS, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

Points awarded

1. (10 pts) _____	**2. (10 pts)** _____
3. (10 pts) _____	**4. (10 pts)** _____
5. (10 pts) _____	**6. (10 pts)** _____
7. (10 pts) _____	**8. (10 pts)** _____
9. (10 pts) _____	**10. (10 pts)** _____
11. (10 pts) _____	**12. (10 pts)** _____

Total Points: _____/120

1. Find L_1 and L_2 where $L_1 = \lim_{(x,y)\to(3,4)} \frac{5x}{\sqrt{x^2+y^2}}$ and $L_2 = \lim_{(x,y)\to(0,0)} \frac{5x}{\sqrt{x^2+y^2}}$. State the reason if any of them does not exist.

$L_1 =$ _____ $L_2 =$ _____

Answer: $L_1 = 3$ **and** $L_2 =$**undefined.**

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

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

State the reason if any of them does not exist.

$f_x(0,0) =$ _____ $f_y(0,0) =$ _____

Answer: $f_x(0,0) =$**undefined and** $f_y(0,0) = 1$**.**

3. Find

$$\left(\frac{\partial w}{\partial z}\right)_y$$

at $(x, y, z) = (1, -1, -3)$ **if** $w = x^2 + y^2 + z^2$ **and** $xz + y \ln x - x^2 + 4 = 0$**.**

Answer: _____

Answer: $-\frac{17}{3}$

4. Find the <u>unit</u> vector(s) such that the directional derivative(s) of $f(x, y) = x^3 e^{-4y}$ **at the point** $(1, 0)$ **is** 0**.**

Answer: _____

Answer: $(-\frac{4}{5}, -\frac{3}{5})$**,** $(\frac{4}{5}, \frac{3}{5})$

5. Use the degree two Taylor polynomial of $\ln(x)$ centered at $x_0 = 1$ to estimate the value of

$$I = \int_{0.7}^{1.3} \ln(x)dx.$$

The approximate value of I is _____.

Answer: -0.009

6. For what values of the constant k will the Second Derivative Test guarantee that $f(x, y) = x^2 + kxy + y^2$ has a minimum at $(0, 0)$?

Answer: _____

Answer: $|k| < 2$

7. Find the equation of the plane that is tangent to the surface $e^z = x^2y - xy^2$ at the point $(3, 2, \ln(6))$.

Answer: _____

Answer: $8(x-3) - 3(y-2) - 6(z - \ln(6)) = 0$

8. Find $\dfrac{\partial z}{\partial u}$ if $z = x^2 + xy^3$ where $x = uv^2 + w^3$ and $y = u + ve^w$ at $u = -1, v = 2, w = 0$.

Answer: _____

Answer: -40

9. Find absolute maximum and minimum values of

$$f(x, y) = x^2 + y^2 - x + y$$

on the disc $x^2 + y^2 \leq 8$.

Answer: max = _____, min = _____

Answer: max=12, min=1/2

10. Find the largest product the positive numbers x, y and z can have if

$$x + y + z^2 = 5.$$

Answer: _____

Answer: 4

11. Evaluate

$$\int_0^4 \int_{\sqrt{x}}^2 9\sqrt{1+y^3}\, dydx.$$

Answer: _____

Answer: 52

12. Find the second order Taylor approximation for e^{xy} near the point $(0,1)$.

Answer: _____

Answer: $1 + x + \dfrac{x^2}{2} + x(y-1)$