Math2210 Midterm 2   Summer, 2010   Dylan Zwick

Name _____ Date _____

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. (25 pts) Find the directional derivative of $f(x,y,z)=x^3 y - y^2 z^2$ at
    $p=(-2,1,3)$ in the direction of $a=i-2j+2k$.

Answer: _____

2. (25 pts) Show that the surfaces $x^2+4y+z^2=0$ and $x^2+y^2+z^2-6z+7=0$ are tangent to each other at (0,-1,2); that is, show that they have the same tangent plane at (0,-1,2).

Tangent Plane: _____

3. (10 pts) Describe the largest set S on which $f(x,y,z)=\sqrt{(1-x^2-y^2-z^2)}$ is continuous.

Answer : _____

4. (25 pts) Find all critical <u>points </u>for $f(x,y)=xy^2-6x^2-3y^2$. Determine whether each point is a minimum, maximum or saddle point.

Critical point(s) (Specify whether they're min, max or saddle.):

_____

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5. For $z = f(x, y) = -2x^2 y^2 + \sin(\pi\, xy) + 5\ln(x + y)$, find

(a) (10 pts) $\dfrac{\partial z}{\partial y}$ at (2, -1)

Answer : _____

(b) (15 pts) f_{xy}

Answer : _____

6. For $f(x,y)=2e^{3y}\cos(2x)$,

(a) (10 pts) Find ∇f .

Answer : _____

(b) (15 pts) Find the equation of the tangent plane at $(\pi/3,0)$.

Answer: _____

7. (20 pts) Use the total differential dz to approximate the change in z as (x, y) moves from P(-2, 4) to Q(-1.98,3.96) for $z = \ln(x^2 y)$

Answer : _____

8. (20 pts) Find $\dfrac{\partial w}{\partial t}$ if $w(x,y)=\sqrt{x^2+y^2+z^2}$, $x=\cos st$, $y=\sin st$,

$z=s^2 t$. (Your answer must be only in terms of s and t.)

Answer : _____

9. Find the limit, if it exists. (Show all your reasoning.)

(a) $\displaystyle \lim_{(x,y)\to(1,2)} \frac{8x^2+3y^3}{x^2+y^2}$ (10 pts)

Answer : _____

(b) $\displaystyle \lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}}$ (15 pts)

Answer : _____