

Date: 061019

MA3160-05 Exam 1

Justify all answers!

Name(print):

1. (10 pts.) Find the equation of the tangent plane at $(1, 2, 1)$ to the surface $x^2 + y^2 - xyz = 3$

2. Let $f(x, y) = \sqrt{x^2 + y^3}$.

(a) (10 pts.) Find the differential of $f(x, y)$ at the point $(1, 2)$.

(b) (5 pts.) Use part (a) to estimate $f(0.9, 2.1)$.

3. (10 pts.) Find the directional derivative of $f(x, y, z) = xz - y^2$ at the point $(0, 2, 3)$ in the direction of a vector making an angle of $\pi/3$ with $\text{grad}f(0, 2, 3)$.

4. (15 pts.) Let $f(x, y) = 1/(xy)$. Find the quadratic Taylor polynomial $Q(x, y)$ valid near $(1, 1)$.

5. (10 pts.) Find the equation of the linear function with the given values

$x \setminus y$	2	5
1	2.5	-0.5
-2	1	-2

6. (15 pts.) Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = xy$ subject to the constraint $4x^2 + y^2 = 8$.

7. (10 pts.) Let $f(x, y) = x\sqrt{(x^2 + y^2)}$. Use the difference quotient to approximate $f_x(1, 0)$ with $h = 0.1$.

8. (15 pts.) Find the point(s) on the surface $xz + 3z + y^2 = 9$ that is (are) closest to the origin.