Math 2415 **Homework Set 4** **10 Points**

Tangent Planes and Normal Lines

1. Find the equations of the tangent plane and normal line to the surface given by $x^3\cos(4y)+4y(3-z)^2=8$ at the point $(-1,0,5)$.

2. Find the point(s) on the surface $3x^2-y^2+6z^2=1$ where the tangent plane is parallel to the plane $9x-3y+z=-2$.

Relative Extrema

For problems 3 & 4 find and classify all the critical points of the given function.

3. $h(x,y)=2x^4+4xy^2-2y^2-4x^2$

4. $g(x,y)=xy\mathbf{e}^{-\left(8x^2+2y^2\right)}$ Hint : Make sure you simplify the derivatives at each step.

Absolute Extrema

5. Find the absolute extrema of $f(x,y)=x(12-y)-\frac{1}{x}-\frac{1}{8(y-12)}$ on the triangle with vertices (1, 0), (4, 0) and (1, 9).

Lagrange Multipliers

For problems 6 – 8 use Lagrange Multipliers to find the maximum and minimum values of the function subject to the given constraint.

6. $f(x,y)=8x^2y \;\; ; \;\; 2x^2+y^2=9$

7. $f(x,y,z)=xyz \;\; ; \;\; 9x^2+y^2-3z=16$

For this problem assume $z\le 0$. Why is this assumption important? And yes I do expect you to answer this….

8. $f(x,y,z)=8z-x^2-2y^2 \;\; ; \;\; x^2+y^2+z^2=7$