Name:_____   Score:_____

Instructions: You must show supporting work to receive full and partial credits. No books or class notes.

1(18 pts) Find the local maxima, minima, and saddle points of the function

$$f(x, y) = x - y + \frac{4}{x} - \frac{1}{y}.$$

2(16 pts) Find the minimum and maximum of the function $w = 2x+y+z+1$ with the constraint $x^2 + y^2 + z^2 = 1$.

3(15 pts) Sketch the region and change the order of integration to $dxdy$ for $\int_0^3 \int_0^{x^2} f(x, y)dydx$.

4(15 pts) Evaluate the integral $\iint_R \frac{x}{\sqrt{x^2 + y^2}}dA$ where the region R is the unit disk in the first quadrant $x^2 + y^2 \leq 1, x \geq 0, y \geq 0$. (Use polar coordinate.)

5(20 pts) Let G be the solid bounded by the three coordinate planes $x = 0, y = 0, z = 0$ and a another plane $2x+y+z = 2$. Set up an iterated triple integral for $\iiint_G f(x, y, z)dV$ in the orders of

(a) $dxdydz$ (b) $dzdxdy$.

6(16 pts) Sketch the region of integration and change the triple integral

$$\int_0^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} zdzdydx$$

to an iterated triple integral in the spherical coordinates.(**DO NOT EVALUATE.**)

Bonus(5 pts) Evaluate the iterated triple integral in the spherical coordinates in Problem 6.

The End