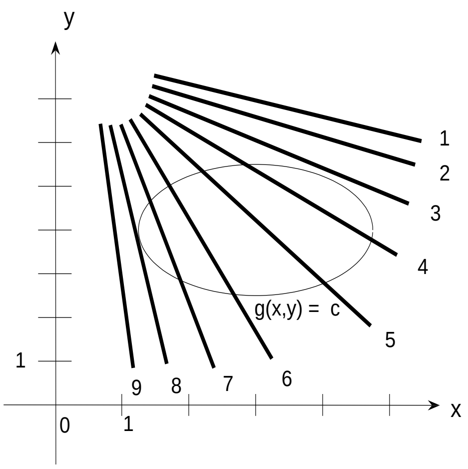
Math 208 Fall 2012 **Exam 3**

Name: ______________________ **Score:** ______________________

Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

1(16pts) Find all critical points of $z = f(x, y) = 4xy - x^4 - \frac{1}{2}y^2$, and use the 2nd derivative test to classify them as local minimum, local maximum, saddle, or none of the above.

2(8pts) Some level curves of a function $z = f(x, y)$ and a curve $g(x, y) = c$ are sketched in the figure below.



(a) Locate approximately and label all points at which $\nabla f(x, y) = \lambda \nabla g(x, y)$.

(b) Locate approximately and label the constraint maximum point and the constraint minimum point for f subject to $g(x, y) = c$.

3(16pts) Consider an iterated double integral $\int_0^4 \int_{\sqrt{y}}^2 \sqrt{1+x^3}\, dx dy$.

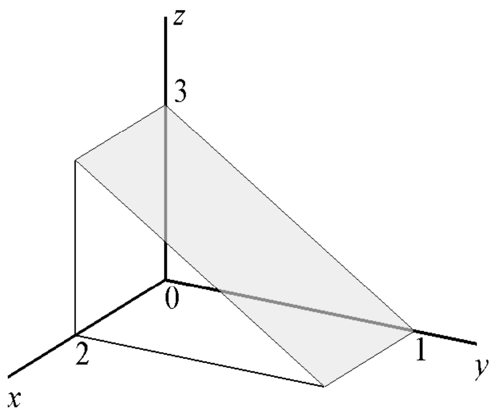
(a) Sketch the region of the integral.

(b) Switch the order of integral.

(c) Evaluate the integral from (b).

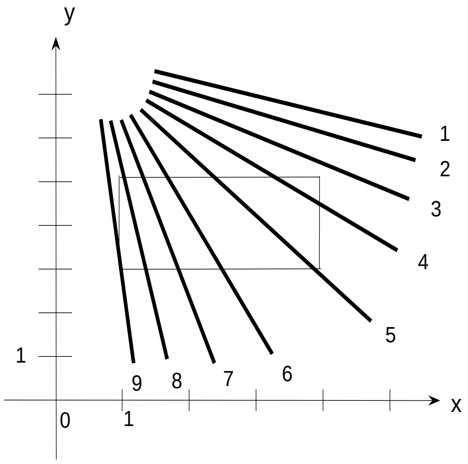
4(16pts) A solid G is bounded by these surfaces: $x = 0,\ x = 2, y = 0, z = 0$, and $3y + z = 3$, as shown.

(a) Set up the iterated integral in the order of $dzdydx$ for a triple integral $\int_G f(x, y, z)dV$.



(b) Set up the iterated integral in the order of $dxdydz$ for a triple integral $\int_G f(x, y, z)dV$.

5(8pts) Some level curves of a function $z = f(x, y)$ are as shown, and consider the double integral $I = \int_1^4 \int_3^5 f(x, y)dydx$. Find an underestimate for the integral with $\Delta x = 1$ and $\Delta y = 2$.



6(16pts) Use the Lagrange multiplier method to find the maximum and minimum of the function $w = f(x, y, z) = x + 2y + 3z$ with (x, y, z) satisfies $x^2 + y^2 + z^2 = 14$.

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2 Bonus Points: What is the first day of this year's fall?