

**MTH 236 Calculus IV Third Exam 092 Name \_\_\_\_\_**

**Note:** *solve* command on calculator for solving simultaneously two equations in terms of  $x$  and  $y$  (for example) : **solve** (equation1 **and** equation2, {**x**, **y**} ).

To solve three equations: **solve** (equation1 **and** equation2 **and** equation 3, {**x**, **y**, **z**} )

(8 pts) 1. Using the method of section 13.8, find the absolute extrema of the function  $f(x, y) = xy - 2x - 5y$  on the triangular region with vertices  $(0,0)$ ,  $(7,0)$  and  $(7,7)$ .

Show your work clearly with detailed explanation:

(8 pts) 2. Use Lagrange multipliers to find the maximum of  $f(x, y) = xy$  subject to the constraint that  $x^2 + y^2 = 18$ . Show your work clearly with detailed explanation.

( 8 pts ) 3. Set up the equations using the method of Lagrange Multipliers with two constraints (Do not solve – just write down the five equations that need to be solved): Find the point of intersection of the plane  $x + 2y + z = 10$  and the parabola  $z = x^2 + y^2$  that is closest to the origin. (*Hint* -- as with assigned problems minimize the *square* of the distance of the point from the origin.)

4. (4 pts) a) Sketch the region R of integration represented by the integral

$$\int_0^1 \int_0^{2x} x + y \, dy \, dx .$$

(4 pts) b) Write down what the iterated integral would be if the order of integration is reversed. (Do not evaluate).

(8 pts) 5. Use a double integral to find the volume under the plane  $z = y$  and over the portion of the disk  $\{(x, y) : x^2 + y^2 \leq 1\}$  in the *first quadrant*.

(8 pts) 6. Give the complete and precise definition of a double integral as a limit of a Riemann sum and explain its interpretation in terms of the volume of a solid approximated by the sum of volumes of approximating rectangular solids.

(8 pts) 7. Sketch the region of integration and then convert the following to an iterated integral in polar coordinates. (Do not evaluate.)

$$\int_0^2 \int_y^{\sqrt{8-y^2}} \frac{1}{\sqrt{1+x^2+y^2}} dx dy$$