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Math 192 Sec S07N01 Test 1 – Feb 2 2007

name (printed)	*student number*

I have read and understood the instructions below:

signature

Instructions:

1. No notes or books are to be used in this test. If you need scrap paper please ask and some will be provided.
2. A non-programmable, non-graphing calculator is permitted.
3. There are 6 pages (including this cover page) in the test. Justify every answer, and clearly show your work. Unsupported answers will receive no credit.
4. You will be given 50 minutes to write this test. Read over the test before you begin.
5. At the end of the test you will be given the instruction "Put away all writing implements and remain seated." *Continuing to write after this instruction will be considered as cheating.*
6. **Academic dishonesty:** Exposing your paper to another student, copying material from another student, or representing your work as that of another student constitutes academic dishonesty. Cases of academic dishonesty may lead to a zero grade in the test, a zero grade in the course, and other measures, such as suspension from this university.

Question	value	score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	**50**	

Question 1:

(a)[3 points] Find $f_x(x, y)$, where

$$f(x, y) = xye^{x^2-y}$$

(b)[3 points] Find $\left(\frac{\partial z}{\partial t}\right)\Big|_{(2,0)}$, where

$$z = g(r, t) = rt(2r - 3t)^2$$

(b)[4 points] Let $z = \ln(xy) - e^{xy}$. Compute

$$(z_{xx} - z_{xy})|_{(1,1)}$$

Question 2 The production function for a certain chemical is given by $P(l,k) = \dfrac{kl}{2k+3l}$, where l represents units of labour, and k units of capital. For each of labour and capital, one unit is \$1000, while output is measured in tonnes.

(a)[7 points] Find (i) the marginal productivity with repect to labour, and (ii) the marginal productivity with respect to capital at a labour and capital combination of $(l,k) = (200, 300)$.

(b)[3 points] Use your result in part (a) to estimate the change in production if labour is maintained at 200 units while capital is decreased from 300 by three units.

Question 3 [10 points] Suppose $f(l,k) = ak^2 + bl^2 - k^2l^2$, where a and b are constants. If this function has a critical point at $(l,k) = (9,4)$, what are the values of a and b?

Question 4 Products A and B have a joint cost function $c = 2q_A^2 + 6q_B^2$ and demand functions

$$p_A = 7 - q_A^2$$
$$p_B = 15 - q_B^2$$

Find the production level (q_A, q_B) at which profit is a relative maximum. Justify your conclusion using the second derivative test.

Question 5 A manufacturer produces product at two different locations: q_1 units are produced at location 1, q_2 units at location 2. Production costs are given by $c = 5q_1^2 + q_1q_2 + 4q_2^2$. If a total of 512 units are to be produced, use the method of Lagrange multipliers to determine the values of q_1 and q_2 which minimize cost. (You may assume the critical point you find does indeed minimize cost.)