The University of British Columbia

MATH 253

Midterm 1

10 October 2012

Time: 50 minutes

FIRST NAME: _____ LAST NAME : _____

STUDENT #: _____

This Examination paper consists of 6 pages (including this one). Make sure you have all 6.

INSTRUCTIONS:

No memory aids allowed. No calculators allowed. No communication devices allowed.
PLEASE CIRCLE YOUR INSTRUCTOR'S NAME BELOW

MARKING:

Q1	/10
Q2	/10
Q3	/10
Q4	/10
TOTAL	/40

Names of Instructors: Jim Bryan, Dale Peterson, Ian Hewitt, Yariv Dror-Mizrahi, Ed Richmond

Q1 [10 marks]

Find the partial derivatives f_x, f_y, and f_{xy} of the following functions:

(*a*)

$$f(x, y) = xe^{xy}$$

(*b*)

$$f(x, y) = x \sin(e^y)$$

(*c*)

$$f(x, y) = \int_y^x t \sin(e^t) dt$$

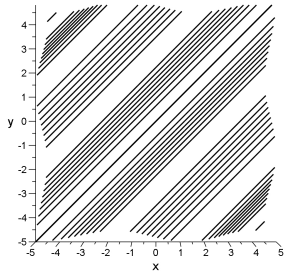
Q2 [10 marks]

Match each function with its contour plot (labeled A-I).

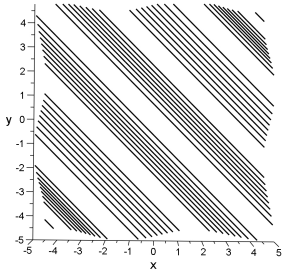
$f(x,y) = \sin(2x) + \sin(y)$ _____ $f(x,y) = \cos(x+y)$ _____ $f(x,y) = 3x - y^2$ _____

$f(x,y) = (x-2)(y+1)$ _____ $f(x,y) = x^2 - y^2$ _____

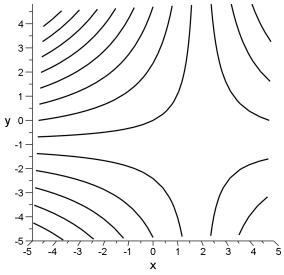
A.



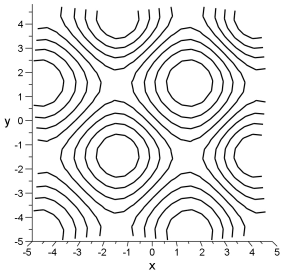
B.



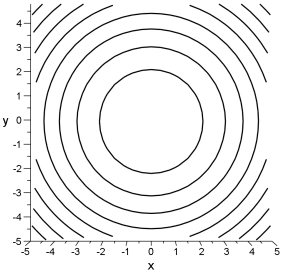
C.



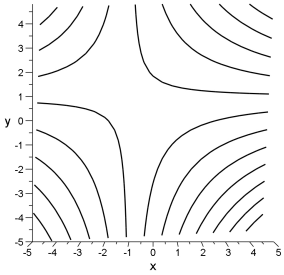
D.



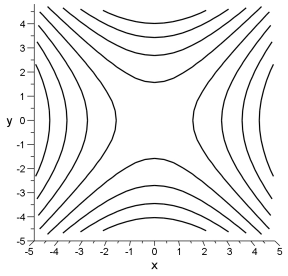
E.



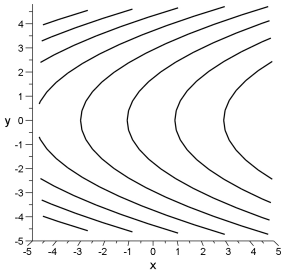
F.



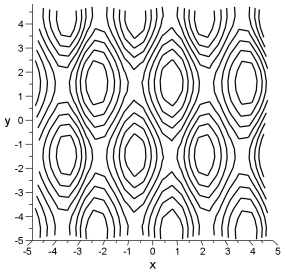
G.



H.



I.



Q3 [10 marks]

Consider the surface $z = x^2 - 6xy + 2y^3$.

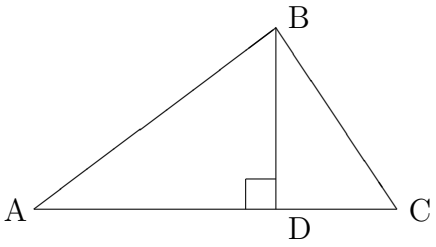
(*a*) Find an equation for the tangent plane to the surface at $(1, 2, 5)$.

(*b*) On the surface near $(1, 2, 5)$, there is a point $(x, 1.99, 5.02)$. Find an approximate value for x.

(*c*) Find all points on the surface where the tangent plane is parallel to the plane $2x+6y+z = 4$.

Q4 [10 marks]

Consider the triangle formed by the three points $A = (4, \frac{3}{\sqrt{2}}, 0)$, $B = (0, 0, \frac{3}{\sqrt{2}})$, and $C = (-3, \frac{3}{\sqrt{2}}, 0)$. Let D be the point obtained by dropping a perpendicular line from B to the side AC as indicated in the following picture. **Please note that the angles and distances of the triangle in this drawing are not necessarily accurate**.



(a) Find the angle between the sides AC and BC.

(b) Find the area of the triangle ABC.

(*c*) Find the equation of the plane containing the points A, B, and C.

(*d*) Find a unit vector which is normal to the plane.

(*e*) Find the coordinates of the point D.