

Name: _____ PID: _____

TA: _____ Sec. No: _____ Sec. Time: _____

Math 10C

Midterm Exam 2 Dec 12, 2008

Turn off and put away your cell phone.

No calculators or any other devices are allowed on this exam.

You may use one page of notes, but no books or other assistance on this exam.

Read each question carefully, answer each question completely, and show all of your work.

Write your solutions clearly and legibly; no credit will be given for illegible solutions.

If any question is not clear, ask for clarification.

The last two pages are blank for extra workspace.

Should your answer for any problem exceed the space provided, please write “see last page” and continue your work on these last two pages.

#	Points	Score
1	9	
2	5	
3	5	
4	7	
5	8	
6	7	
7	3	
8	6	
Σ	50	

1. (a) (5 pts) Let $f(x, y) = 7y^2 + xe^y$, $x = st$, and $y = s + t$. Find $\frac{\partial f}{\partial s} \Big|_{(s,t)=(0,-1)}$.

(b) (4 pts) Let $g(x, y) = e^{x^2+xy}$. Find g_{xy} .

2. (5 pts) Match the following equations to their graphs below (No justification is required for this problem):

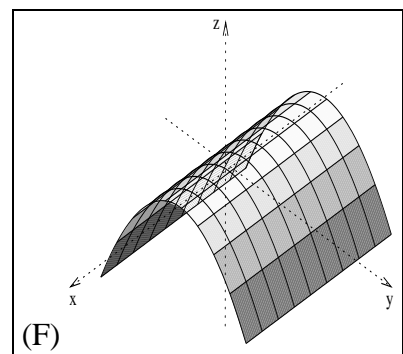
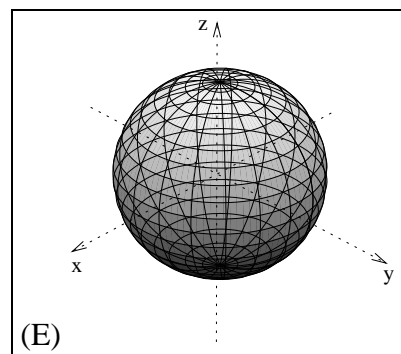
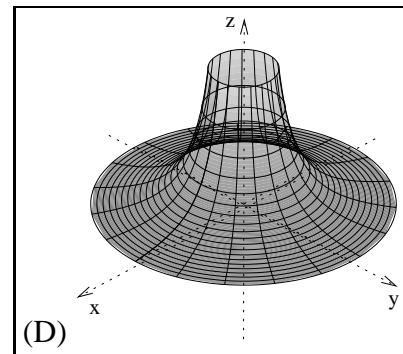
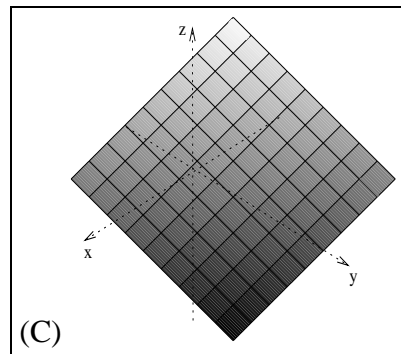
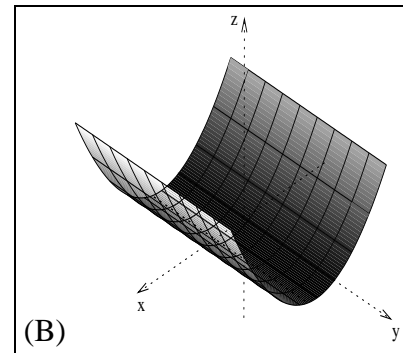
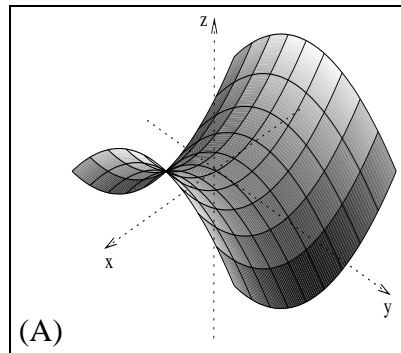
(i) $z = x^2 - y^2$ _____

(ii) $z = x^2 + 2x$ _____

(iii) $x^2 + y^2 + z^2 = 9$ _____

(iv) $x + y + z = 1$ _____

(v) $z = \frac{1}{x^2 + y^2}$ _____



3. (5 pts) Find a unit vector which is parallel to both of the following planes:

$$x + 3y - 5z = 1$$

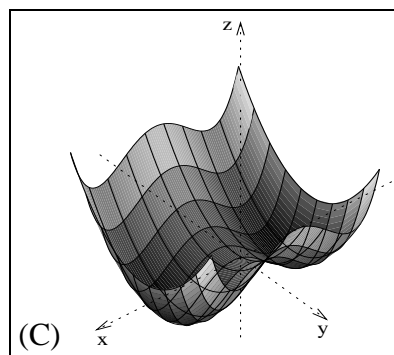
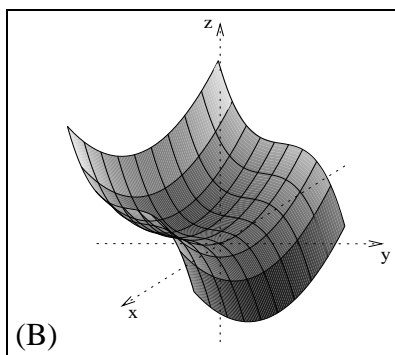
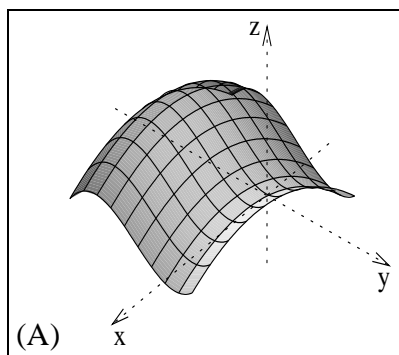
$$-x + 2z = 7$$

4. (7 pts) Find the maximum and minimum values of $f(x, y) = x^4 - 4y^2 + 5$ over the region $\{x^2 + y^2 \leq 9\}$.

5. Let $f(x, y) = y^3 + 2xy - x^2$.

(a) (6 pts) Find the critical points of $f(x, y)$, and classify them as local maxima, local minima, or saddle points.

(b) (2 pts) Based on your answer in part (a), determine which of the following is the graph $z = f(x, y)$:



6. The temperature (in Celsius) at point (x, y) on a hot plate is given by:

$$T(x, y) = \frac{y}{x^2 + 4}.$$

Suppose an ant is located at the point $(1, -5)$.

(a) (5 pts) In which direction should the ant walk in order to reach a cooler place (in its immediate surroundings) as quickly as possible? Please give your answer in the form of a unit vector which points in that direction.

(b) (2 pts) What is the rate of change of the temperature if the ant walks towards the point $(5, 4)$ on the hot plate?

7. (3 pts) Find the tangent plane of the surface $x^2 + xy - z^2 = -9$ at the point $(4, 0, -5)$.

8. (6 pts) Find the quadratic approximation of the function $f(x, y) = \ln(x^2 + y)$ about the point $(x, y) = (-1, 0)$

Extra space