**Math 201** Final Examination ( Time: 2.25 hrs.) (Fall 2012)

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**Name:** ……………………………………….. (VERY CLEARLY)

 **I.D** ...........................................

*Circle your Section number* ( - 2 points if incorrect)

**Sec 8 (12:30T) — Sec 9 (2:00 T) — Sec 10 (11:00 T) — Sec 11 (5:00 T) ---**

 **Sec 12 (9:00M) — Sec 13 (3:30 R) — Sec 14 (10:00 M) — Sec 15 (5:00 R) ---**

If you know limits like  **Simply write the answer** ( without proof)

**1.** (8%) a. Investigate  for convergence or divergence.

|  |  |
| --- | --- |
|  Problem 1 8% |  |
|  Problem 2 6% |  |
|  Problem 3 8% |  |
|  |  |
|  Problem 4 8% |  |
|  Problem 5 8% |  |
|  Problem 6 8% |  |

b. Investigate  for convergence or divergence. (Hint:  = )

|  |  |
| --- | --- |
|  Problem 7 9% |  |
|  Problem 8 9% |  |
|  Problem 9 9% |  |

|  |  |
| --- | --- |
|  |  |
|  Problem 10 9% |  |
|  Problem 11 10% |  |
|  Problem 12 8% |  |

**2.** (6 %) a. Find the interval of convergence of 

Reminder: Check end-points

**3.**  a) (5 %) Let  

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b) (3%) **Find** 

**Hint:** Use the (Nahlus) estimates for continous **increasing** (positive) functions are





**Continue on the back side.**

**4.** a) (4%) Find the parametric equations for the line L tangent to the curve of intersection of the surfaces  at the point P(1,1,1).

(Hint: L lies in both tangent planes)

b) (4%) Given that and the components of  are never zero,

PROVE that 

**5.** (8%) Set up (as explained below) the maximum value of the function on the **upper**  disk bounded by .

**|||||||||| Set up => Find ALL candidate points; THEN STOP! STOP! ||||||||||||**

**(Please Circle each candidate point)**



**6.** a) (4%) Investigate the critical point (0, 2) of the function



for local maxima, local minima, saddle points.

b) (5%) Let $f\left(x,y\right)=\sqrt{25-x^{2}-y^{2}}+(7x+8y $+100)

.Assume WITHOUT proof that (0,0) = 7 and (0,0) =8

From definitions, **show that *f* is differentiable at (0,0).**

**7.** a) (5%) Find the value of 

b )(4%) **Evaluate**   by changing to polar coordinates.

**8**. a) (5%) Set up the integrals to find the area of the region that is inside the big loop of the

 Limacon & outside the circle .

**8b)** (4%) Set up the integrals in **cylindrical** coordinates to find the volume in the 1st octant

 BELOW the paraboloid 

(Draw very carefully!

(Note The needed intersection is at z=1 (not z=0) with the same circle.)

**9.** a(5%) Let V be the same region in problem 8b in the 1st octant

below the paraboloid .

Set up the integrals to find the volume of V in spherical coordinates

 in the order *dρ dϕ dθ*.

9b) (4%) Set up the integral(s) to find the volume of V (above) in the order *dϕ dρ dθ.*

( If you can not solve for cos ϕ, put **?** & loose only 1 pt.)

**10.** a) (7%) Evaluate the  over the solid ellipsoid 

Hint: Let x=2u, y=5v, z=10w. Then integrate in the uvw-space.

**b)** (2%) Set up the integrals to find  (only) of the centroid of a plane region R

 in the 1st quadrant bounded by .

Note: *All curves C below (in problems 10—12) are assumed to be* *smooth (except for finitely many points)* ***counter clockwise, and traced once.***

**11.** (a)(4%) Use **Green’s Theorem** to find the circulation of the vector field and C is the circle: .

**b.** (4%) Evaluate for any wild path C

lying in the right-half plane (x>0) from A(1,1) to B(2,6)

by finding a potential function f(x,y) **by inspection. Hint: Try**  

**c.** (2%) Solve part b above without finding a potential function f(x,y)?

**12. a)** (4%) Use **Green’s theorem** (with holes) to find 

 for any simple closed curve C . (To get full credit, check all details)

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**b. (2%)** Use part (a) to compute

(Hint: Make a substitution to use part (a)

**-------------------------------------------------------------------------------------------------**

**c. (2%)** Set up the **Line** integral to find the area of the “bumped” Cardiod.

 