

**Math 201 - Final (Spring 17)**

**T. Tlas**

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- Write the answers to questions 2, 3, 4 and 6 on their sheets. The other two questions have extra sheets for you to write your answers on them. Any part of your answers written on the wrong sheet will not be graded. Note that a sheet of paper has two sides, you can write on both of them.
- There are 6 problems in total. Some questions have several parts to them. Make sure that you attempt them all.
- This is a closed book exam and no calculators are allowed.

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Name :

ID # :

Section :

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<i>Q1</i>	
<i>Q2</i>	
<i>Q3</i>	
<i>Q4</i>	
<i>Q5</i>	
<i>Q6</i>	
<i>TOTAL</i>	

**Problem 1**

(6 points each) Which of the following series converge and which diverge? Those which converge, do they converge absolutely or conditionally? When possible find the sum of the series.

i-

$$\sum_{n=0}^{\infty} \frac{(2n)!}{3^n n!}$$

ii-

$$\sum_{n=0}^{\infty} (-1)^n \frac{9^n}{(2n)!}$$

iii-

$$\sum_{n=0}^{\infty} \frac{1}{(n+1)(n+2)}$$

iv-

$$\sum_{n=0}^{\infty} \frac{n-1}{n^2+3}$$

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ADDITIONAL SHEET FOR PROBLEM 1 ANSWER

**Problem 2**

(12 points) Evaluate the following integral

$$\int_0^{0.1} e^{-x^2} dx$$

with an error less than  $10^{-8}$ . Is your answer an over- or an under-estimate?

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**Problem 3**

(20 points) Find the minimum value of the function  $f(x, y) = 4x^2 + 9y^2$  subject to the constraint  $x^2 - y^2 = 1$ .

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**Problem 4**

(10 points) Let  $f(x, y) = \frac{1}{\sqrt{x^2+y^2}}$ . Integrate this function over the region  $R$  which consists of all points in the plane which are in the first quadrant, inside the circle  $x^2 + y^2 = 4$  and above the line  $y = x$ .

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**Problem 5**

(12 points each) Integrate the function  $f(x, y, z) = \frac{1}{\sqrt{x^2+y^2}}$  over the following two regions:

i-  $R_1$  is the region bounded from above by  $z = 2$  and from below by the cone  $x^2 + y^2 - z^2 = 0$ .

ii-  $R_2$  is the region in the first octant inside the sphere  $x^2 + y^2 + z^2 = 1$  but above the cone  $x^2 + y^2 - z^2 = 0$ .

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ADDITIONAL SHEET FOR PROBLEM 5 ANSWER



**Problem 6**

(10 points)

$$1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \dots}}} = ?$$

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