MTH101-Calculus and Analytical Geometry

Final Term Examination – Spring 2006
Time Allowed: 150 Minutes

Please read the following instructions carefully before attempting any of the questions:

1. **Pasting the equations of math type from word file into software may cause some visibility problem, so please note that do not copy equations of math type into software from word file. Paste the equations from math type directly into software.**

2. Do not ask any questions about the contents of this examination from anyone.

a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.

b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.

c. Write all steps, missing steps may lead to deduction of marks.

****WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

Question No. 1 **Marks : 10**

Find the area of the surface generated by revolving the curve $y = x^3, 0 \le x \le \frac{1}{2}$ about the x-axis.

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 2 **Marks : 10**

Find the limit using L' Hopital's Rule

$$\lim_{x \to +\infty} \left(\frac{x+1}{x+2} \right)^x .$$

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 3 **Marks : 10**

Determine whether the series converges or diverges. If it converges, find the sum

$$\sum_{k=1}^{\infty} \left(\frac{3}{4}\right)^{k-1}$$

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 4 **Marks : 2**

Two non vertical lines with slopes m_1 and m_2 respectively are parallel if and only if

退 $m_1 m_2 = 1$
退 $m_1 m_2 = -1$
退 $m_1 m_2 = 1$
退 $m_1 m_2 = -1$

Question No. 5 **Marks : 5**

What is the difference between differentiation and integration?

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 6 **Marks : 2**

The series $\sum_{n=1}^{\infty} \frac{1}{n}$

退 Converges
退 Absolutely converges
退 Diverges
退 Non of the other

Question No. 7 **Marks : 2**

Acceleration of a moving particle is given as $a(t) = 9t^2 - 7t + 3$. We can find _____ for the moving particle.

退 Velocity function
退 Position function
退 Both (a) & (b)
退 None of the other

Question No. 8 **Marks : 2**

$\sum_{k-3}^{100} k = ?$

退 5047
退 5050
退 5053
退 None of the
退 other

Question No. 9 **Marks : 4**

If the distance traveled by the car is y = f(x) given in the function below, then find the velocity $\frac{dy}{dx}$ of the car.

Where

$$lny = e^{y} sinx$$

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 10 **Marks : 10**

Is $f(x) = \begin{cases} x^2+1, & 0 < x \le 1 \\ x, & 1 < x \le 4 \\ 2x+1, & 4 \le x \end{cases}$ continuous at x = 1?

Write all necessary steps and justify your answer.

Note: In order to get the maximum marks you have to show all the necessary steps.

Question No. 11 **Marks : 8**

Evaluate

$$\frac{z}{\sqrt[3]{z^2+1}} dz$$

Note: In order to get the maximum marks you have to show all the necessary steps.