MA 126 - CALCULUS II
Friday, April 25, 2008

Name (Print last name first):. . . . . .

Signature: . . . . . .

Section: . . . . . Instructor Name: . . . . . .

FINAL EXAM

Closed Book. No calculators are permitted.

PART I - Basic Skills

Each question is worth 5 points.

Part I consists of 8 questions. Clearly write your answer (only) in the space provided after each question. You need not show your work for this part of the exam. No partial credit is awarded for this part of the exam! CHECK YOUR ANSWERS!

Question 1

Find an **equation of a sphere** that has center $(4, 3, 7)$ and one of its diameters has endpoint $(2, 1, 6)$.

Answer: . . . . . .

Question 2

Find the **dot product** of two vectors $\mathbf{u}$ and $\mathbf{v}$ if $|\mathbf{u}| = 8$, $|\mathbf{v}| = \frac{1}{4}$ and the angle between them is $\frac{\pi}{4}$.

Answer: . . . . . .

Question 3

Find the **parametric equations** of the line that passes through the point $P(2, 3, 1)$ and is parallel to the vector $\mathbf{v} = \langle 3, 1, -7 \rangle$.

Answer: .....

Question 4

Use the Fundamental Theorem of Calculus to find the **derivative** of the function

$$g(x) = \int_1^x \cos(t^5)\, dt$$

Answer: .....

Question 5

Evaluate the **indefinite integral**

$$\int 2xe^{x^2}\, dx$$

Answer: .....

Question 6

Determine whether the improper integral is **convergent or divergent**. Evaluate the integral if it is convergent.

$$\int_1^\infty \frac{1}{\sqrt{x}}\,dx$$

Answer: .....

Question 7

Find the **area** of the region bounded by the parabola $y = 3x^2 + 2$, the horizontal line $y = 0$, and the vertical lines $x = 0$ and $x = 1$. (Your answer must be a number!)

Answer: .....

Question 8

Determine whether the **alternating series** $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^5}$ is divergent, absolutely convergent, or conditionally convergent.

Answer: .....

PART II - Problem Solving skills

Each problem is worth 12 points.

Part II consists of 5 problems. You must show your work on this part of the exam to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit. CIRCLE YOUR ANSWER!

Problem 1

(a) Find the **parametric equations** for the line passing through the points $P(3, 1, 2)$ and $Q(2, 0, 1)$.

(b) Determine the **coordinates** of the point where the line obtained in (a) intersects the xz-plane.

(c) Find **an equation of the plane** that passes through the point $P(4, 0, -3)$ and is perpendicular to the normal vector $\mathbf{n} = \langle 2, 4, 8 \rangle$.

Problem 2

The velocity function (in miles per second) of an object moving along a line is given by

$$v(t) = 3t - 5, \qquad 0 \leq t \leq 2.$$

(a) Find the **displacement** (in miles) of the object during the time interval $0 \leq t \leq 2$.

(b) Find the **distance traveled** (in miles) by the object during the time interval $0 \leq t \leq 2$.

Problem 3

Evaluate the following integrals (clearly show the techniques of integration you use):

(a) $\displaystyle\int_e^{\infty} \frac{1}{x(\ln x)^2}\,dx$

(b) $\displaystyle\int x \sin x\,dx$

Problem 3 (continued)

Evaluate the following integral (clearly show the technique of integration you use):

(c) $\displaystyle\int_0^1 \frac{x-2}{x^2+3x+2}\,dx.$

Problem 4

(a) Find the **volume of the solid** obtained by rotating about the x-**axis** the region **bounded** by the curve $y = \dfrac{1}{x}$, the horizontal line $y = 0$ and the vertical lines $x = 1$ and $x = 2$.

(b) Find the **length of the curve**

$$y = \frac{x^2}{2} - \frac{\ln x}{4}$$

when $1 \leq x \leq 3$.

Problem 5

This problem has two separate questions. (Answer all the questions!)

(a) Consider the series

$$\sum_{n=1}^{\infty} \left(\frac{x+2}{\pi} \right)^{n-1}.$$

Answer all the following questions.

(a_1) Find the values of x for which the series converges. (Write your answer in interval notation!)

(a_2) Find the sum of the series for those values of x.

(b) Test the following alternating series for convergence. In order to receive credit, you must give the reasoning for your conclusion.

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}.$$

DO NOT ENTER ANY PROBLEM SOLUTIONS OR WORK ON THIS PAGE.

Summary of scores on problems - for grading purposes only.

	Points
Part I	
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Question 6	
Question 7	
Question 8	
Part II	
Problem 1	
Problem 2	
Problem 3	
Problem 4	
Problem 5	
Total Test Score	

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