MA 126 - 8C   CALCULUS II
October 07, 2014

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

Student Signature: ....

$$\boxed{\textbf{TEST II}}$$

$$\boxed{\textbf{Closed book - Calculators and One Index Card are allowed!}}$$

$$\boxed{\textbf{PART I}}$$

Part I consists of 6 questions. Clearly write your answer (only) in the space provided after each question. You do not need not to show your work for this part of the test. Limited partial credit is awarded for this part of the test!

Each question is worth 5 points.

Question 1

If $\int_{-2}^{3} f(x)\,dx = 7$ and $\int_{1}^{3} f(x)\,dx = -10$, find the numerical value of $\int_{-2}^{1} f(x)\,dx$.

Answer: ....

Question 2

Find the derivative of the function $g(x) = \int_{-1}^{x} t^3 \sin(t^4)\,dt$.

Answer: ....

Question 3

Evaluate the definite integral

$$\int_{e^7}^{e^{15}} \frac{3}{x} \, dx$$

(Your answer must be a real number!)

Answer: ....

Question 4

Evaluate the indefinite integral $\int \frac{e^x}{e^x + 9} \, dx.$

Answer: ....

Question 5

Evaluate the indefinite integral $\int x \cos(x) \, dx.$

Answer: ....

Question 6

Using the midpoint rule, set up a Riemann sum with 5 terms to approximate $\int_0^1 \cos(x^2) \, dx.$
(Do not simplify or evaluate the sum!)

Answer: ....

$$\boxed{\textbf{PART II}}$$

Each problem is worth 14 points.

Part II consists of 5 problems. <u>You must show your work</u> on this part of the test to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit - <u>no credit for unsubstantiated answers</u>!

<u>Problem 1</u>

Consider the function $f(x) = (x-3)^2$ on the interval $[2, 5]$.

(a) Find the average value, f_{ave}, of the function f on the given interval. (Your answer must be a real number!)

(b) Find the numerical value(s) of c such that $f(c) = f_{\text{ave}}$.

Problem 2

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

$$v(t) = t - 1, \qquad 0 \le t \le 3.$$

(a) Find the displacement (in meters) of the object during the time interval $0 \le t \le 3$.

(b) Find the distance (in meters) traveled by the object during the time interval $0 \le t \le 3$.

Problem 3

This problem has two separate questions (a) and (b). Answer each question.

(a) A particle is traveling along the space-curve

$$\mathbf{r}(t) = \langle 2\cos(t),\ 4\sin(t),\ 3t\,\rangle$$

when the time t is such that $-\infty < t < \infty$.

   (ı) Determine the velocity vector of the particle at the time $t = 0$.

   (ıı) Find the unit tangent vector to this space-curve when $t = 0$.

(b) Evaluate the following definite integrals by interpreting each in terms of areas.

   (ı) $\displaystyle\int_0^3 \sqrt{9 - x^2}\,dx.$

   (ıı) $\displaystyle\int_0^2 |x - 1|\,dx.$

Problem 4

This problem has two separate questions (a) and (b). Answer each question.

(a) Evaluate the definite integral $\displaystyle\int_{e^{16}}^{e^{49}} \frac{1}{x\sqrt{\ln(x)}}\,dx$. (Your answer must be a real number!)

(b) Evaluate the definite integral $\displaystyle\int_{0}^{\pi/2} 30\,\sin^2(x)\cos^3(x)\,dx$. (Your answer must be a real number!)

Problem 5

This problem has two separate questions (a) and (b). Answer each question.

(a) Evaluate the definite integral $\displaystyle\int_0^1 e^{\sqrt{x}}\,dx$. (Your answer must be a real number!)

(Hint: Make a substitution...!)

(b) Evaluate the indefinite integral $\displaystyle\int x^5 \sin(x^3)\,dx$.

(Hint: Use a substitution first, and then integration by parts...!)

SCRATCH PAPER

(Scratch paper will not be graded!)

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