Math 120 – Calculus B
Fall Semester 2000
First Midterm
Thursday, September 21

Name:______________________________ **Section:**____________

This examination consists of 15 problems, worth a total of 100 points on 8 pages, including this front cover. If problems are missing from your copy, you must ask for a new copy right away. The first ten problems are multiple choice **with no partial credit for any reason**. Be sure to indicate your single answer to each question by placing an × through that letter on the answer grid below. Students will **NOT** be allowed extra time to fill in the grid after the exam has ended if they forget to do so during the exam!

1.	a	b	c	d	e	**6.**	a	b	c	d	e
2.	a	b	c	d	e	**7.**	a	b	c	d	e
3.	a	b	c	d	e	**8.**	a	b	c	d	e
4.	a	b	c	d	e	**9.**	a	b	c	d	e
5.	a	b	c	d	e	**10.**	a	b	c	d	e

The last 5 problems are partial credit problems. Be sure to show all work legibly. Clearly indicate your final answer, which should be simplified whenever possible. **Books, notes and CALCULATORS are NOT permitted. Sign the following honor code statement:**

"On my honor, I have neither given nor received unauthorized aid on this exam."

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1. Which of the following expresses $\int_2^5 x^4\,dx$ as a limit of Riemann sums?

(a) $\lim_{n\to\infty} \sum_{i=1}^{n} (5 + \frac{3i}{2})^4 \frac{3}{n}$

(b) $\lim_{n\to\infty} \sum_{i=1}^{n} (2 + \frac{3i}{n})^5 \frac{5}{n}$

(c) $\lim_{n\to\infty} \sum_{i=1}^{n} (1 + \frac{3i}{n})^4 \frac{3}{n}$

(d) $\lim_{n\to\infty} \sum_{i=1}^{n} (2 + \frac{3i}{n})^4 \frac{3}{n}$

(e) $\lim_{n\to\infty} \sum_{i=1}^{n} (2 + \frac{3i}{4})^5 \frac{3}{5n}$

2. Which of the following is an expression for $\int_1^2 x\,dx$ directly from the definition? (Recall that $\Sigma_{i=1}^{n} i = \frac{n(n+1)}{2}$.)

(a) $\lim_{n\to\infty} (\frac{2}{n} + \frac{n(n+1)}{2n^2})$

(b) $\lim_{n\to\infty} (1 + \frac{n(n+1)}{2n^2})$

(c) $\lim_{n\to\infty} (\frac{1}{2} + \frac{n(n+1)}{n^2})$

(d) $\lim_{n\to\infty} (n + \frac{n(n+1)}{2n})$

(e) $\lim_{n\to\infty} (\frac{1}{n} + \frac{n(n+1)}{2n^2})$

3. Suppose $x^3 \leq f(x) \leq x^2$ for $0 \leq x \leq 1$. Which of the following must be true?

(a) $\frac{1}{3} \leq \int_0^1 f(x)\,dx \leq \frac{1}{2}$

(b) $1 \leq \int_0^1 f(x)\,dx \leq 3$

(c) $\frac{1}{4} \leq \int_0^1 f(x)\,dx \leq \frac{1}{3}$

(d) $\int_0^1 f(x)\,dx$ is negative

(e) $\int_0^1 f(x)\,dx$ is zero

4. Compute

$$\int_2^3 3x^2 - 2x + 7 \; dx$$

(a) 59 (b) 14 (c) -18 (d) 39 (e) 21

5. Compute

$$\int sec^2(x) tan(x) \; dx$$

(a) $tan(sec(x)) + C$ (b) $sec(tan(x)) + C$ (c) $sec^2(x)$

(d) $\frac{1}{2} sec(x) tan(x) + C$ (e) $\frac{1}{2} tan^2(x) + C$

6. Find the area between $y = 1$, $y = -2$, $x = y^2$ and $x = 2y - 2$.

(a) $\frac{8}{3}$ (b) 8 (c) 12 (d) $-\frac{8}{3}$ (e) -12

7. The natural length of a spring is 30 cm. If a 10 N force holds it at 35 cm, how much work was required to move it there from its natural position?

(a) .5 J (b) 50 J (c) 25 J (d) .25 J (e) 5 J

8. Find the average value of the function $y = cos\left(\frac{\pi}{2} sin(x)\right) cos(x)$ over the interval between 0 and $\frac{\pi}{2}$.

(a) $\frac{4}{\pi^2}$ (b) $\frac{\pi^2}{8}$ (c) $\frac{8}{\pi^2}$ (d) $\frac{\pi}{4}$ (e) $\frac{\pi}{8}$

9. Which of the following is the derivative of $g(x) = e^{tan(x)}$?

(a) $tan(x)\ e^{sec^2(x)}$ (b) $sec^2(x)\ e^{tan(x)}$ (c) $e^{tan(x)} + C$

(d) $e^{sec^2(x)}$ (e) $e^{sec(x)tan(x)}$

10. Integrate

$$\int_0^{\frac{\pi}{2}} 2sin(x)cos(x)e^{sin^2(x)}\ dx$$

(a) $e - 1$ (b) $1 - e$ (c) $e^2 - 1$ (d) $\frac{e^2}{2} - \frac{1}{2}$ (e) e

11. Approximate the area between $y = x$ and $y = x^2$ using left endpoints and $n = 3$ subintervals.

12. If

$$h(x) = \int_{2-4x^2}^{4x^2-2} sin(t^2)\ dt$$

compute $h'(x)$.

13. Find the volume of the solid formed by rotating the region between $x = 1$, $y = 0$ and $x = y^2$ around the line $x = 1$.

14. Compute the volume of the solid formed by rotating the area under the curve $y = sin(x^2)$ between 0 and $\sqrt{\pi}$ around the y-axis.

15. If a child succeeds in emptying a rectangular bathtub by splashing all of the water over the sides, give a formula for the work done by the child in terms of the length (l), width (w) and height (h) of the tub. (Using metric units the wieght of water is 9800 $\frac{N}{m^3}$.) Your work should include at least one Riemann sum approximating the work.