MA123 Exam 3

April 9 2008

NAME _____ Section _____

Problem	Answer
1	a b c d e
2	a b c d e
3	a b c d e
4	a b c d e
5	a b c d e
6	a b c d e
7	a b c d e
8	a b c d e
9	a b c d e
10	a b c d e
11	a b c d e
12	a b c d e
13	a b c d e
14	a b c d e
15	a b c d e

Instructions. Circle your answer in ink on the page containing the problem and on the cover sheet. After the exam begins, you may not ask a question about the exam. Be sure you have all pages (containing 15 problems) before you begin.

A list of formulas that may be useful for this exam is on the last page (you may tear off the formula page if you wish).

For grading use:

Number of problems correct: _____/15

SCORE: _____/100

NAME_____

1. A rectangular pool of dimensions 10 ft.× 20 ft.× 6 ft. (length × width × height) is filled with water at a rate of 1.5 ft^3/min. How fast is the level of the water rising when the pool is half full?

   (a) 0.0075 ft/min.
   (b) 0.0085 ft/min.
   (c) 0.006 ft/min.
   (d) 0.005 ft/min.
   (e) 0.009 ft/min.

2. Find the area of the largest rectangle with one corner at the origin, the opposite corner in the first quadrant on the graph of the line $f(x) = 6-3x$, and sides parallel to the axes.

   (a) 1
   (b) 2
   (c) 3
   (d) 4
   (e) 5

3. Use the table for the function $\ln(x)$ (last page of exam) or a calculator to estimate the integral

$$\int_1^2 \ln(x)\,dx$$

   Use four subintervals and the right endpoint of each subinterval to determine the height of the rectangles used in the approximation. The approximate value of the integral is

   (a) 0.218
   (b) 0.297
   (c) 0.352
   (d) 0.470
   (e) 0.521

4. Evaluate the sum

$$8 + 10 + 12 + 14 + \ldots + 600$$

The sum equals

(a) 90288
(b) 90294
(c) 90300
(d) 90306
(e) 90312

5. Suppose you estimate the integral

$$\int_2^8 f(x)\,dx$$

by evaluating a sum

$$\sum_{k=1}^{n} \Delta x \cdot f(2 + k \cdot \Delta x)$$

If you use 12 intervals of equal length, what value should you use for Δx?

(a) 0.1
(b) 0.2
(c) 0.3
(d) 0.4
(e) 0.5

6. Evaluate the sum

$$\sum_{k=3}^{6} (k^2 - 1)$$

(a) 35
(b) 60
(c) 82
(d) 98
(e) 122

7. Suppose the product of x and y is 64 and both x and y are positive. What is the minimum possible sum of x and y?

   (a) 9
   (b) 12
   (c) 15
   (d) 16
   (e) 20

8. If
$$\sum_{k=1}^{n}(k^2-k)=\frac{n(n+1)(n-1)}{A},$$
find A.

   (a) 1
   (b) 3
   (c) 5
   (d) 8
   (e) 10

9. Evaluate the limit
$$\lim_{n\to\infty}\frac{2n^2+3}{(n+4)^2}$$

   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) Does not exist

10. Suppose you estimate the area under the graph of $f(x) = x^3$ from $x = 5$ to $x = 25$ by adding the areas of rectangles as follows: partition the interval into 20 equal subintervals and use the right endpoint of each interval to determine the height of the rectangle. What is the area of the 11th rectangle?

    (a) 1000
    (b) 1331
    (c) 2744
    (d) 3375
    (e) 4096

11. Find

$$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{4k}{n^2}$$

    (a) 0
    (b) 2
    (c) 4
    (d) 8
    (e) Does not exist

12. Two trains leave a station at the same time. One train travels east at a speed of 15 miles per hour. The other train travels north at a speed of 20 miles per hour. How fast (in miles per hour) are the trains traveling away from each other when the eastbound train is 30 miles from the station?

    (a) 25
    (b) 35
    (c) 40
    (d) 50
    (e) 100

13. Suppose you estimate the integral

$$\int_2^6 f(x)\,dx$$

by adding the areas of n rectangles of equal base length, and you use the right endpoint of each subinterval to determine the height of each rectangle. If the sum you evaluate is written as

$$\sum_{k=1}^{n} \frac{A}{n} \cdot f\left(B + \frac{Ak}{n}\right),$$

what are A and B?

(a) $A = 2$, $B = 4$
(b) $A = 4$, $B = 4$
(c) $A = 4$, $B = 2$
(d) $A = 2$, $B = 2$
(e) None of the above

14. Evaluate the integral

$$\int_0^2 4 - 2x\,dx$$

(Hint: Think of the definite integral as an area.)

(a) 0
(b) 1
(c) 2
(d) 3
(e) 4

15. Given that the area of the ellipse $4x^2 + y^2 = 4$ is 2π, evaluate the integral

$$\int_0^1 \sqrt{4 - 4x^2}\,dx$$

(Hint: Think of the definite integral as an area.)

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

Table for the function $\ln(x)$.

x	$\ln(x)$	x	$\ln(x)$
1.00	0.000	1.50	0.405
1.05	0.049	1.55	0.438
1.10	0.095	1.60	0.470
1.15	0.140	1.65	0.501
1.20	0.182	1.70	0.531
1.25	0.223	1.75	0.560
1.30	0.262	1.80	0.588
1.35	0.300	1.85	0.615
1.40	0.336	1.90	0.642
1.45	0.372	1.95	0.668
		2.00	0.693

Geometric Formulas

1. Areas
   (a) Triangle $A = \frac{bh}{2}$
   (b) Circle $A = \pi r^2$
   (c) Rectangle $A = lw$
   (d) Trapezoid $A = \frac{a+b}{2}h$
2. Volumes
   (a) Rectangular Solid $V = lwh$
   (b) Sphere $V = \frac{4}{3}\pi r^3$
   (c) Cylinder $V = \pi r^2 h$
   (d) Cone $V = \frac{1}{3}\pi r^2 h$
3. Summation

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

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$