MATH 151, SPRING 2006
COMMON EXAM III - VERSION B

LAST NAME, First name (print): ______________________________

INSTRUCTOR: ______________________________

SECTION NUMBER: ______________

UIN: ______________________________

SEAT NUMBER: ______________________________

DIRECTIONS:

1. The use of a calculator, laptop or computer is prohibited.
2. In Part 1 (Problems 1-12), mark the correct choice on your ScanTron form No. 815-E using a No. 2 pencil. *For your own records, also record your choices on your exam!*
3. In Part 2 (Problems 13-18), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
4. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: ______________________________

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-12		48
13		8
14		10
15		10
16		10
17		8
18		6
		100

PART I

1. (4 pts) If $f(x) = \sin^{-1}(x^2)$, then $f'(1/\sqrt{2}) =$

   (a) $2\sqrt{3}$

   (b) $\dfrac{4}{\sqrt{6}}$

   (c) $\dfrac{2}{\sqrt{6}}$

   (d) $\sqrt{2}$

   (e) $\dfrac{4\sqrt{2}}{5}$

2. (4 pts) $\displaystyle\lim_{\theta \to 0} \frac{\tan^{-1}(\theta) - \theta}{\theta^3} =$

   (a) -3

   (b) $-\dfrac{1}{3}$

   (c) 0

   (d) $-\dfrac{1}{2}$

   (e) -2

Exam continues on next page

3. (4 pts) If $g(x) = \ln(1 + e^{\sqrt{x}})$, then $g'(x) =$

(a) $\sqrt{x}$

(b) $\dfrac{e^{\sqrt{x}}}{2\sqrt{x}(1 + e^{\sqrt{x}})}$

(c) $\dfrac{e^{\sqrt{x}}}{1 + e^{\sqrt{x}}}$

(d) $\sqrt{x} - \dfrac{1}{2}\ln x - \ln 2$

(e) $\dfrac{1}{1 + e^{\sqrt{x}}}$

4. (4 pts) Find $\lim_{x\to\infty} (1 + 2x)^{1/x}$.

(a) e^2

(b) 0

(c) 2

(d) e

(e) 1

Exam continues on next page

Problems 5-7 deal with the graph of the function $f(x) = \dfrac{x^3}{3} - \dfrac{7x^2}{2} + 6x + 9$.

5. (4 pts) Find the interval(s) on which the function f is decreasing.

   (a) $\{x < 1\} \cup \{x > 6\}$
   (b) $\{1 < x < 6\}$
   (c) $\{x < 7/2\}$
   (d) none of the above
   (e) $\{x > 6\}$

6. (4 pts) Find the interval(s) on which the graph of the function f is concave up.

   (a) $\{1 < x < 6\}$
   (b) none of the above
   (c) $\{x > 7/2\}$
   (d) $\{x < 7/2\}$
   (e) $\{x < 1\} \cup \{x > 6\}$

7. (4 pts) Find the x-coordinate(s) of all local minima.

   (a) $x = 0$
   (b) $x = 6$
   (c) $x = 7/2$
   (d) $x = 1$ and $x = 6$
   (e) $x = 1$

Exam continues on next page

8. (4 pts) Which of the following is a correct antiderivative for the function $\ln x$?

(a) $x \ln x - x$

(b) $e^x \ln x$

(c) $x \ln x + x$

(d) $\ln x$

(e) xe^x

9. (4 pts) Find the absolute maximum value of $f(x) = 2x^3 - 3x^2 - 12x + 5$ on the interval $[0, 4]$.

(a) 5

(b) 12

(c) 45

(d) 37

(e) -15

10. (4 pts) Let $y(t) = A + e^{kt}$ where A and k are constants. Find k if $y(2) = 4$ and $y(4) = 6$.

(a) $\dfrac{\ln 2}{2}$

(b) $4 \ln 2$

(c) 2

(d) $2 \ln 2$

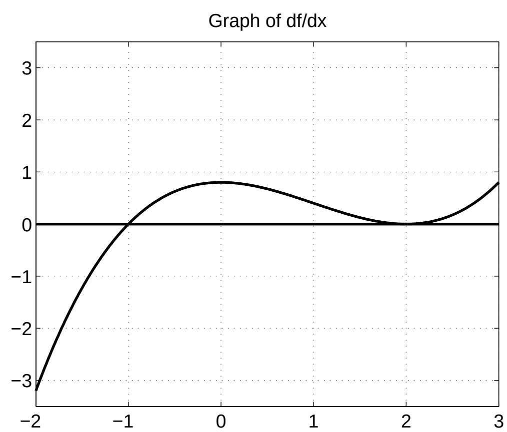
(e) $\ln 2$

Exam continues on next page

11. (4 pts) $\sum_{i=3}^{6}(2i-1) =$

(a) 48
(b) 39
(c) 32
(d) 24
(e) 27

12. (4 pts) The graph of the derivative, $\dfrac{df}{dx}$, is shown below. Which statement about the function f is *false*?



(a) $x = 2$ is a relative minimum
(b) f is increasing on $(2, 3)$
(c) f is decreasing on $(-2, -1)$
(d) $x = -1$ is a relative minimum
(e) f is increasing on $(-1, 2)$

Exam continues on next page

PART II

13. (8 pts) If $y = (3x + \ln x)^x$, find $\dfrac{dy}{dx}$.

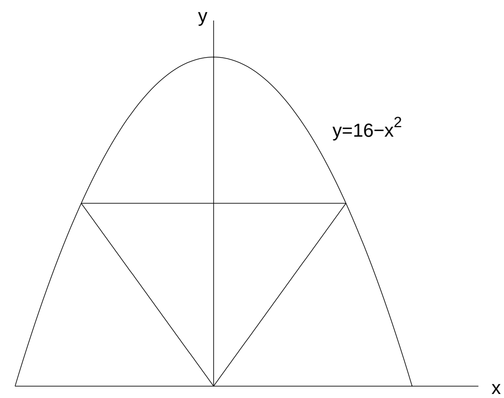
14. (10 pts) A particle moves in a straight line and has acceleration given by $a(t) = 2 + 6t$ cm/sec^2. At time $t = 3$ seconds, its velocity is $v(3) = 8$ cm/sec and its initial displacement is $s(0) = 9$ cm. Find its position function $s(t)$.

Exam continues on next page

15. (10 pts) A colony of bacteria grows at a rate proportional to its size. The initial population is 1000 and at the end of ten minutes the population has increased by 2 percent. How long does it take the initial population to double? *Include units in your answer!*

Exam continues on next page

16. (10 pts) An isosceles triangle with its vertex pointing down has its base parallel to and above the x-axis. The base vertices lie on the parabola $y = 16 - x^2$. What is the largest area the triangle can have? *Clearly justify your answer!*



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17. (a) (5 pts) Express $\lim_{n\to\infty} \frac{3}{n} \sum_{i=1}^{n} \left(1 + \frac{3i}{n}\right)^5$ as a definite integral.

(b) (3 pts) Express $\int_{-1}^{5} f(x)\,dx - \int_{-1}^{0} f(x)\,dx + \int_{5}^{8} f(x)\,dx$ as a single integral in the form $\int_{a}^{b} f(x)\,dx$.

Exam continues on next page

18. (6 pts) The table gives the values of a function obtained from an experiment. Use them to estimate $\int_0^{10} f(x)\,dx$ using $n = 5$ and right endpoints.

x	0	2	4	6	8	10
$f(x)$	1	3	-2	-1	2	4

End of Exam