MATH 151, FALL 2008
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.http://www.math.tamu.edu/
2. In Part 1 (Problems 1-12), mark the correct choice on your ScanTron using a No. 2 pencil. *For your own records, also record your choices on your exam!*
3. In Part 2 (Problems 13-17), 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		10
14		10
15		8
16		12
17		12
Total		100

PART I: Multiple Choice

1. (4 pts) $\lim_{x\to\infty} \arccos\left(\dfrac{1-x}{2x+3}\right) =$

   (a) $\dfrac{\pi}{3}$

   (b) $\dfrac{\pi}{6}$

   (c) $\dfrac{2\pi}{3}$

   (d) $\dfrac{5\pi}{6}$

   (e) $-\dfrac{\pi}{3}$

2. (4 pts) If $f'(x) = 3\cos x + 5\sin x$ and $f(0) = 4$, find $f(\pi)$.

   (a) -6

   (b) 4

   (c) 14

   (d) 2

   (e) -7

3. (4 pts) The critical numbers for $f(x) = \sqrt[3]{x^2 - 2x}$ are

   (a) $x = 1$ only

   (b) $x = 1$, $x = 0$ and $x = 2$ only

   (c) $x = 0$ and $x = 2$ only

   (d) $x = 0$ and $x = 1$ only

   (e) $x = 2$ only

4. (4 pts) Find the absolute extrema for $f(x) = x^3 - 12x + 1$ on $[-3, 0]$.

   (a) absolute maximum: 17; absolute minumum: -15
   (b) absolute maximum: 10; absolute minumum: 1
   (c) absolute maximum: 10; absolute minumum: -15
   (d) absolute maximum: 17; absolute minumum: 1
   (e) There is no absolute extrema.

5. (4 pts) Find $\lim_{x \to 0} \dfrac{2^x - 5^x}{x}$

   (a) 0
   (b) ∞
   (c) 1
   (d) $\ln \dfrac{2}{5}$
   (e) $\ln(10)$

6. (4 pts) $f(x) = x^2 e^x$ has:

   (a) A local minimum $x = 0$ and no local maximum.
   (b) A local maximum at $x = 2$ and a local minimum at $x = 0$.
   (c) A local maximum at $x = -2$ and a local minimum at $x = 0$.
   (d) A local maximum at $x = -2$ and no local minimum.
   (e) A local maximum at $x = 2$ and no local minimum.

7. (4 pts) Evaluate $\int_0^3 \sqrt{9-x^2}\,dx$ by interpreting the definite integral in terms of area.

(a) $\frac{3\pi}{4}$

(b) $\frac{9\pi}{2}$

(c) $\frac{3\pi}{2}$

(d) 3π

(e) $\frac{9\pi}{4}$

8. (4 pts) Use the midpoint rule with $n = 4$ to approximate $\int_1^2 \ln x\,dx$

(a) $\ln\frac{9}{8} + \ln\frac{11}{8} + \ln\frac{13}{8} + \ln\frac{15}{8}$

(b) $\frac{1}{2}\left(\ln\frac{5}{4} + \ln\frac{7}{4} + \ln\frac{9}{4} + \ln\frac{11}{4}\right)$

(c) $\ln\frac{5}{4} + \ln\frac{7}{4} + \ln\frac{9}{4} + \ln\frac{11}{4}$

(d) $\frac{1}{4}\left(\ln\frac{9}{8} + \ln\frac{11}{8} + \ln\frac{13}{8} + \ln\frac{15}{8}\right)$

(e) $\frac{1}{2}\left(\ln\frac{9}{8} + \ln\frac{11}{8} + \ln\frac{13}{8} + \ln\frac{15}{8}\right)$

9. (4 pts) A population of bacteria triples every 5 minutes. If the population follows the exponential growth model, $y = y_0 e^{kt}$, find k.

(a) $\frac{\ln 2}{5}$

(b) 3

(c) 5

(d) $\frac{\ln 3}{5}$

(e) Insufficient information

10. (4 pts) $\dfrac{d}{dx}\displaystyle\int_1^{\ln x} \dfrac{dt}{\sqrt{t^3+t}} =$

(a) $\dfrac{1}{\sqrt{(\ln x)^3+\ln x}}$

(b) $\dfrac{2\sqrt{(\ln x)^3+\ln x}}{x}$

(c) $\dfrac{1}{x\sqrt{(\ln x)^3+\ln x}}$

(d) $6x^2\sqrt{(\ln x)^3+\ln x}$

(e) $2\sqrt{(\ln x)^3+\ln x}$

11. (4 pts) Find $f'(e)$ for $f(x) = \ln(x + \ln x)$.

(a) $\dfrac{1}{e+1}$

(b) $\dfrac{1}{e}$

(c) $\dfrac{e+1}{e^2}$

(d) 2

(e) $\dfrac{2}{e}$

12. (4 pts) $\displaystyle\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 dx =$

(a) $\dfrac{42}{3}$

(b) $\dfrac{13}{4}$

(c) $\dfrac{27}{2} + \ln 4$

(d) $\dfrac{15}{2} + \ln 4$

(e) None of these.

PART II WORK OUT

Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box 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.

13. (10 pts) Find $\lim_{x\to\infty}\left(1-\frac{3}{x}\right)^{x}$.

14. (a) (4 pts) $\sin\left(\arccos\left(\frac{4}{5}\right)\right) =$

(b) (6 pts) Find the derivative of $f(x) = \arctan(\arcsin x)$.

15. (8 pts) Suppose a particle is moving with acceleration $\mathbf{a}(t) = \langle 1, 2t\rangle$, initial velocity $\mathbf{v}(0) = \langle 1, -1\rangle$ and initial position $\mathbf{s}(0) = \langle 0, 1\rangle$. Find the position, $\mathbf{s}(t)$, at time t.

16. (12 pts) Suppose 36 square feet of material is available to make a box with a closed top. The length of the base is 3 times the width. What are the dimensions of the box that maximizes the volume? Justify ALL steps.

Exam continues on next page

17. If $f(x) = x^4 - 6x^2 + 4$:

(i) (5 pts) Find the intervals where f is increasing and decreasing.

(ii) (5 pts) Find the intervals where f is concave up and concave down.

(iii) (2 pts) Find the inflection points of f.

End of Exam