MATH 152, Spring 2009
COMMON EXAM III - VERSION A

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 1-11), 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 12-16), 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
1-11		44
12		10
13		12
14		14
15		10
16		10
		100

PART I: Multiple Choice

1. (4 pts) If $T_3(x)$ is the third degree Taylor Polynomial for $f(x) = \ln x$ at $x = 1$, then $T_3(2) =$

   (a) $\frac{7}{6}$

   (b) $\frac{1}{3}$

   (c) $\frac{5}{3}$

   (d) $\frac{5}{6}$

   (e) $\frac{18}{3}$

2. (4 pts) If we approximate $f(x) = \sin x$ with a thrid degree Taylor Polynomial at $x = \frac{\pi}{3}$, use Taylor's Inequality to estimate the accuracy of the approximation $\sin x \approx T_3(x)$ for $0 \leq x \leq \frac{2\pi}{3}$.

   (a) $|R_3(x)| \leq \frac{(\pi/3)^4}{24}$

   (b) $|R_3(x)| \leq \frac{(\pi/3)^3}{6}$

   (c) $|R_3(x)| \leq \frac{\sqrt{3}(\pi/3)^4}{48}$

   (d) $|R_3(x)| \leq \frac{\sqrt{3}(\pi/3)^3}{12}$

   (e) $|R_3(x)| \leq \frac{(\pi/3)^4}{48}$

3. (4 pts) If the series $\sum_{n=1}^{\infty} a_n$ has a partial sum of $s_n = 4 + \ln(2n) - \ln(n+1)$, then $\sum_{n=1}^{\infty} a_n =$

(a) ∞

(b) 4

(c) $4 + \ln 2$

(d) $4 + \ln \frac{1}{2}$

(e) Not enough information to determine.

4. (4 pts) For which of the following series is the Ratio Test inconclusive?

(a) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$

(b) $\sum_{n=1}^{\infty} \frac{2^n}{n5^n}$

(c) $\sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt{\ln n}}$

(d) $\sum_{n=0}^{\infty} \frac{n3^n}{2^n(n+1)}$

(e) $\sum_{n=1}^{\infty} \frac{n}{(-2)^n}$

5. (4 pts) The series $\sum_{n=1}^{\infty} \frac{2+\cos n}{n^2}$

(a) Converges by the Comparison Test with $\sum_{n=1}^{\infty} \frac{3}{n^2}$.

(b) Converges by the Comparison Test with $\sum_{n=1}^{\infty} \frac{2}{n^2}$.

(c) Converges to 0.

(d) Diverges by the Comparison Test with $\sum_{n=1}^{\infty} \frac{2}{n^2}$.

(e) Diverges by the Test for Divergence.

6. (4 pts) The series $\sum_{n=0}^{\infty} \frac{(-1)^n + 3^n}{5^n}$

(a) Converges to $\frac{15}{4}$.

(b) Converges to $\frac{25}{12}$.

(c) Converges to $\frac{5}{6}$.

(d) Converges to $\frac{10}{3}$.

(e) Converges to 0.

7. (4 pts) The series $\sum_{n=1}^{\infty}\left(\sin\frac{1}{n} - \sin\frac{1}{n+2}\right)$

(a) Diverges.

(b) Converges to $\sin(1)$.

(c) Converges to $\sin(1) + \sin\left(\frac{1}{2}\right)$.

(d) Converges to 0.

(e) Converges to $\sin(1) + \sin\left(\frac{1}{3}\right)$.

8. (4 pts) Find the center and radius of the sphere $x^2 + y^2 + z^2 = 2x - 4y + 6z$.

(a) $C(1, 2, 3)$, $r = \sqrt{14}$

(b) $C(1, 2, 3)$, $r = \sqrt{37}$

(c) $C(1, -2, 3)$, $r = \sqrt{14}$

(d) $C(1, -2, 3)$, $r = \sqrt{37}$

(e) $C(-1, 2, 3)$, $r = \sqrt{14}$

9. (4 pts) Which of the following is a Maclaurin series for $f(x) = x^2 \sin x$?

(a) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{4n+2}}{(2n+1)!}$

(b) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{4n}}{(2n)!}$

(c) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{4n+1}}{(2n+1)!}$

(d) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+3}}{(2n+1)!}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+2}}{(2n)!}$

10. (4 pts) Which of the following statements is true?

(a) The series $\sum_{n=1}^{\infty} \frac{n}{4n+100}$ diverges by the test for divergence.

(b) The series $\sum_{n=1}^{\infty} \frac{\sqrt[3]{n}}{\sqrt{n}}$ is a convergent p-series.

(c) The series $\sum_{n=0}^{\infty} 2\left(\frac{5}{3}\right)^n$ is a convergent geometric series.

(d) The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ converges, but not absolutely.

(e) All of the above statements are true.

11. (4 pts) The series $\sum_{n=1}^{\infty} \frac{5^n(x-3)^n}{n!}$ has radius of convergence of:

(a) $R = 0$

(b) $R = \infty$

(c) $R = 3$

(d) $R = 5$

(e) $R = \frac{3}{5}$

PART II WORK OUT

Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box your final answers.* You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

12. (10 pts) Find the radius and interval of convergence of the series $\sum_{n=2}^{\infty} \frac{(-3)^n (x-1)^n}{\sqrt{n}}$

13. (12 pts) Express $f(x) = \ln(2 - x^3)$ as a power series about $x = 0$ and identify the radius of convergence.

14. (10 pts) (a) Determine whether the series $\sum_{n=2}^{\infty} \frac{(-1)^n}{n \ln n}$ converges or diverges. If the series converges, does it converges absolutely?

(b) (4 pts) Determine whether the series $\sum_{n=2}^{\infty} \frac{1}{n \ln n + \sqrt{n}}$ converges.

15. (10 pts) Find the Taylor Series for $f(x) = \dfrac{1}{x}$ at $x = 3$. Express your answer in summation notation.

16. (10 pts total) Consider the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{3^n n!}$.

a.) (3 pts) Prove the series converges absolutely.

b.) (3 pts) Approximate the sum of the series with s_4, the fourth partial sum. Do not simplify.

c.) (4 pts) Find an upper bound on the remainder, R_4, in using s_4 to approximate the sum of the series. Do not simplify.

End of Exam