MA2108 **Midterm** **25 September 2001**
Professor J. Wu

Time allowed: 1.5 hours

Tutorial Group:(circle one)

Tuesday 12-1	Thursday 12-1	Thursday 1-2	Friday 4-5
Tuesday 1-2	Friday 9-10	Friday 10-11	Friday 11-12

ID number:_____
Name:_____
Signature:_____

ANSWERS to #1 – 8:

1. A ◯ B ◯ C ◯ D ◯ E ◯ F ◯
2. A ◯ B ◯ C ◯ D ◯ E ◯ F ◯
3. A ◯ B ◯ C ◯ D ◯ E ◯ F ◯
4. A ◯ B ◯ C ◯ D ◯ E ◯ F ◯
5. A ◯ B ◯
6. A ◯ B ◯
7. A ◯ B ◯ C ◯
8. A ◯ B ◯ C ◯

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Problem #	Your Grades
1 (8 points)	
2 (8 points)	
3 (8 points)	
4 (8 points)	
5 (8 points)	
6 (8 points)	
7 (8 points)	
8 (8 points)	
9 (18 points)	
10 (18 points)	
total (100 points)	

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1. Determine limit of the sequence

$$\left\{\ln\frac{2n+1}{5+2n}+\cos\frac{n^2\pi+1}{4n+2n^2+2}\right\}.$$

Answer:
(A). -1 (B). 0 (C). 1. (D). $\ln 2$. (E). $+\infty$ (F). the limit does not exist.

2. The limit of the sequence $\left\{\left(1-\frac{3}{n+1}\right)^{2n}\right\}$ is
(A). 0. (B). divergent. (C). e^{-1}. (D). e^2. (E). e^{-3}. (F). e^{-6}.

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3. The limit of the sequence $\left\{ \dfrac{1}{\sqrt{n}(\sqrt{2+n}-\sqrt{n})} \right\}$ is

(A). -2. (B). -1. (C). 0. (D). 1. (E). 2. (F). ∞.

4. The limit of the sequence $\left\{ \dfrac{(n+2)!+n^3}{n^2(3^n+n!)} \right\}$ is

(A). 0. (B). $+\infty$. (C). 1. (D). 2. (E). 3. (F). 6.

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Determine the absolute convergence, conditional convergence or divergence of the following series.

5. $\sum_{n=1}^{\infty} \frac{1}{2n-1}$. Answer: (A). convergence. (B). divergence.

6. $\sum_{n=1}^{\infty} \frac{3^n + n^3}{4^n + n^4}$ Answer: (A) convergence. (B). divergence.

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7. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{1}{\sqrt{n}+2}$

Answer: (A). absolute convergence. (B). conditional convergence. (C). divergence.

8. $\sum_{n=1}^{\infty}\frac{(-1)^n \sin n}{n(\ln n+1)^2}$.

Answer: (A). absolute convergence. (B). conditional convergence. (C). divergence.

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9. (a) Let A and B be nonempty bounded sets of real numbers. Suppose that A is a subset of B. Show that $\sup A \leq \sup B$.

(b) Consider the sequence $\{a_n\}$ given by

$$a_1 = \sqrt{3}, \qquad a_n = \sqrt{3a_{n-1}} \quad n = 2, 3, 4, \cdots .$$

Show that $\{a_n\}$ converges, and find the limit.

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10. (a) Let $\sum_{n=1}^{\infty} a_n$ be a series with $a_n \geq 0$. Suppose that $\sum_{n=1}^{\infty} a_n$ is convergent. Show that the series $\sum_{n=1}^{\infty} a_n^2$ is also convergent.

(b) Determine the domain of the function $f(x)$ defined by $f(x) = \sum_{n=1}^{\infty} n(2x-1)^n$.