

Name: _____
Exam II
October 27, 2005

Math 222
Lecture 2
Shirin Malekpour

CIRCLE YOUR TA'S NAME:
JAY HEUMANN EKIN OZMAN
LOIZOS SOLOMOU MIKE ROSE

I	24 Points	
II	15 Points	
III	15 Points	
IV	21 Points	
V	25 Points	
Total	100 Points	

WRITE YOUR NAME AND CIRCLE YOUR TA'S NAME ON EVERY ANSWER SHEET.
SHOW YOUR REASONING. YOU NEED TO SHOW WORK TO GET FULL CREDIT. NO CALCULATORS ARE ALLOWED. LEAVE YOUR ANSWERS IN FORM OF $\sqrt{2} + \pi^3$, $\ln(2)$, ETC.

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Mike Rose

I. (24 points.) Indicate whether the given series converges or diverges and give a reason for your conclusion.

(a) $\sum_{n=1}^{\infty} \frac{5^{2n}}{n!}$

(b) $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n^3 + n^2}{n^4 + 5}$

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

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II. (15 points.)

(a) Determine whether $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{\sqrt{n}}$ converges or diverges. Justify your answer.

(b) True or false: if $\sum_{n=1}^{\infty} a_n$ converges, so does $\sum_{n=1}^{\infty} a_n^2$. Justify your answer.

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III. (15 points.)

(a) Find the limit, $\lim_{x \rightarrow \infty} [\ln(x+1) - \ln(x-1)]$.

(b) Determine if $\sum_{n=1}^{\infty} [\ln(n+1) - \ln(n-1)]$ converges or diverges and, if converges find its sum.

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IV. (21 points.)

(a) Find the terms through x^6 in the Maclaurin series for $\frac{x^2}{3-x^2}$.

(b) Find the convergence set for the power series you computed in part (a).

(c) Find the sum $\cos\left(\frac{\pi}{4}\right) + \frac{\cos^2\left(\frac{\pi}{4}\right)}{2!} + \frac{\cos^3\left(\frac{\pi}{4}\right)}{3!} + \frac{\cos^4\left(\frac{\pi}{4}\right)}{4!} + \dots$ by recognizing how it is related to something familiar.

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V. (25 points.)

- (a) Find the Taylor series in $x - a$ through $(x - a)^3$ for $f(x) = \cos x$ and $a = \frac{\pi}{4}$.
- (b) Approximate $\cos(47^\circ)$ ($47^\circ = \frac{\pi}{4} + \frac{\pi}{90}$ radians) using your answer in the previous part.
- (c) Give a bound for the error of the approximation.