Midterm 1

MAT 127

Oct 2, 2018

Name: (please print)	**ID #**:
Your section: (see list below)	

Lecture 1	MWF 10:00am-10:53am	Chuanhao Wei
Lecture 2	MF 1:00 pm – 2:20 pm	Jingrui Cheng
Lecture 3	TuTh 10:00 am – 11:20 am	Sabyasachi Mukherjee
Lecture 4	TuTh 5:30 pm – 6:50 pm	Babak Modami

No notes, books or calculators.

You must show your reasoning, not just the answer. Answers without justification will get only partial credit. Your solutions should be written so that the grader is able to follow your reasoning and computations.

Please cross out anything that is not part of your solution — e.g., some preliminary computations that you didn't need. Everything not crossed out will be considered part of your solution and graded.

When computing numerical answers, please do not replace algebraic expressions and constants such as $\sqrt{2}$ or π by approximate values — instead, leave $\sqrt{2}$ in your final answer.

	1 15pt	2 15pt	3 20pt	4 10pt	**Total** 60pts
Grade					

1. *(15 pts)*

(a) Determine whether the following sequence converges. If it converges, find the limit.

$$a_n = \frac{n^3 + 4}{n^3 - 2n^2 + 4}$$

(b) Determine whether the following sequence converges. If it converges, find the limit.

$$a_n = \frac{n^2 + 3}{e^n}$$

(c) Consider the sequence given by $a_1 = \sqrt{2}$, $a_2 = \sqrt{2a_1} = \sqrt{2\sqrt{2}}$, $a_3 = \sqrt{2a_2}$, $\ldots$, $a_{n+1} = \sqrt{2a_n}$. It is known that this sequence is monotonically increasing and bounded above. Is the sequence $\{a_n\}_n$ convergent? Justify your answer. If it converges, find the limit.

2. *(15 pts)*

(a) Determine whether the following series converges or diverges.

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

(b) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{n^3+1}{n^4+2n+3}$$

(c) Determine whether the following series converges or diverges.

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

3. *(20pts)*

(a) Find the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{4n^2-1}$.

(Hint: factor the denominator and write it as a telescopic sum!)

(b) Write the number $2.1\overline{79} = 2.1797979\ldots$ as a fraction.

4. *(10 pts)*

Find the radius of convergence, and interval of convergence of the power series:

$$\sum_{n=1}^{\infty} \frac{4^n (x-2)^n}{3n}.$$

You are not required to determine whether the series is convergent at the endpoints of the interval of convergence.