Recitation Exam 5

● Graded

Student

Ivan Wang

Total Points

0 / 5 pts

Question 1

(ST6) - Question 1   🚩   **0** / 1 pt

✔ **− 1 pt** (P) Progressing

① This is not the ratio test

Question 2

(ST8) - Question 2   **0** / 1 pt

✔ **− 1 pt** (P) Progressing

✔ **− 0 pts** **Abs Series:** Incorrect / missing conclusion for $\sum |a_n|$

✔ **− 0 pts** **Abs Series:** Incorrect / missing series test for $\sum |a_n|$ (Need to show all work for limit comparison test)

✔ **− 0 pts** **Original Series:** Incorrect / missing conclusion for $\sum a_n$

✔ **− 0 pts** **Original Series:** Incorrect / missing series test for $\sum a_n$ (Need to show all work for alternating series test)

✔ **− 0 pts** **Conclusion:** Incorrect / missing conclusion about absolute convergence vs conditional convergence vs divergence.

Question 3

(PS1) - Question 3   **0** / 1 pt

✔ **− 1 pt** (P) Progressing

✔ **− 0 pts** **Setup:** Incorrect / missing $|a_{n+1}/a_n|$

Question 4

(PS2) - Question 4   **0** / 1 pt

✔ **− 1 pt** (P) Progressing

Question 5

(PS3) - Question 5   **0** / 1 pt

✔ **− 1 pt** (P) Progressing

Name: Ivan Wang   Student ID: 5041431

MTH 142 —— Recitation Exam #5

Directions

1. ~~You're going to do great!~~
2. **Series Tests** - Whenever you state that a series is convergent or divergent, you must state the name of the series test you are using to make this claim and then show and verify all necessary conditions for that series test.
3. Show all necessary work, unless otherwise indicated.
4. Use correct notation.

Academic Integrity

Take this exam with integrity. **Don't cheat.**

1. No calculators or electronic devices are allowed.
2. No other resources are allowed during the exam (this means notes, formula sheets, people, websites, etc.)

Any academic integrity violation will result in **at least** a 0 on this exam.

Grading

Each question will be graded on the M/P/U scale described in the course syllabus.

Mastery (M): All necessary work is shown, your answer is correct, and correct mathematical notation is used. (Small non-calculus mistakes that do not significantly detract from the solution may be okay.)

Progressing (P): Any question earning this score **can be attempted again** during the follow-up exam. This gives you another opportunity to demonstrate Mastery. Future attempts will not necessarily be the exact same question, but will assess the same learning outcome.

Unsatisfactory (U): Any question earning this score **cannot be attempted again.**

Q1: (ST6) Use the **Ratio Test** to determine if the series is convergent or divergent.

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

$$|a_n| = \left| \frac{n!}{(3n+1)(-4)^n} \right|$$

$$\sqrt[n]{|a_n|} = \left| \frac{n!}{(3n+1)(-4)^n} \right|^{\frac{1}{n}}$$

If $L < 1$ convergent
If $L = 1$ inconclusive
If $L > 1$ divergent

$$\lim_{n \to \infty} \sqrt[n]{|a_n|} = \left(\frac{n!}{(3n+1)(4)^n} \right)^{\frac{1}{n}}$$

$$\Rightarrow \lim_{n \to \infty} \left(\frac{n!^{(\frac{1}{n})}}{(3n+1)^{\frac{1}{n}}(4)} \right) \Rightarrow$$

$$\lim_{n \to \infty} \left(\frac{1}{(3n+1)^{\frac{1}{n}} \cdot 4} \right) = \lim_{n \to \infty} \left(\frac{1}{1 \cdot 4} \right)$$

$$= \frac{1}{4}$$

Since $L = \frac{1}{4} < 1$, the series is converges by the ratio test.

Q2: (ST8) Determine if the series is absolutely convergent, conditionally convergent, or divergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{6n+5}}$$

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{6n+5}} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(6n+5)^{1/2}}$$

$$\lim_{n \to \infty} |a_n| = \lim_{n \to \infty} \left| \frac{(-1)^{n+1}}{(6n+5)^{1/2}} \right| = \lim_{n \to \infty} \frac{1}{(6n+5)^{1/2}} = \frac{1}{0} = 0$$

since $\lim_{n \to \infty} |a_n| = 0$ absolute converget test is inconclusive.

~~the ratio test.~~

Series is diverget by the absolute converged test

Q3: (PS1) Find the **Radius of Convergence** for:

$$\sum_{n=1}^{\infty}(-1)^n\frac{5^n(x-3)^n}{\sqrt[3]{n}}$$

$$\left|a_{n+1}\cdot\frac{1}{a_n}\right| = \left|\frac{(-1)^{n+1}\cdot 5^{n+1}(x-3)^{n+1}}{(n+1)^{1/3}}\right|$$

$$\left|\left((-1)^{n+1}\cdot\frac{5^{n+1}(x-3)^{n+1}}{(n+1)^{1/3}}\right)\cdot\frac{5^{1/3}}{5^n(x-3)^n\cdot\frac{1}{(n+1)}}\right|$$

$$=\left|\quad\right|$$

$$R=$$

Q4: (PS2) Find the **Interval of Convergence** for: (Same series from Q3, just continue your work.)

$$\sum_{n=1}^{\infty}(-1)^n\frac{5^n(x-3)^n}{\sqrt[3]{n}}$$

Q5: (PS3) Find a **power series representation** centered at $a = 0$ for the function and find the radius of convergence. Write the power series in sigma form: $\sum c_k x^k$

$$\frac{8x^3}{1 + 7x}$$

Prototype $\dfrac{1}{1-X}$ $\qquad \displaystyle\sum_{n=1}^{\infty}$

Extra Space - Clearly indicate in the original answer space if there is any work you want graded here.