

MATH231 SPRING 2022 MIDTERM 3 (50 POINTS)

- **No notes, calculators, or other aids are allowed.**
- Read instructions carefully and write your answers in the space provided.
- There are 24 questions in total. You have 45 minutes to answer them.
- To receive full credit, you must show **all** of your work. (That is, **you are supposed to justify any formula which haven't been given in class or derived in homework.**)
- You may use a different method other than the one asked in the question. However, the maximum points you can get will be half of the total points.

1. (8 points) Use the limit comparison test to determine if $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{\sqrt{n^4 + 3n - 1}}$ converges or diverges.

Q2–Q4. Determine if the alternating series is absolutely convergent, conditionally convergent or diverges. You may use any method.

2. (8 points) $\sum_{n=1}^{\infty} \frac{(-3)^n \cdot n^2}{(2n)!}$

3. (6 points) $\sum_{n=2}^{\infty} \frac{(-1)^n}{(\ln n)^n}$

4. (10 points) $\sum_{n=2}^{\infty} \frac{(-1)^n}{\sqrt{n+1} + \sqrt{n}}$

5. (10 points) Determine the radius of convergence R and interval of convergence I for the series

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

6. (8 points) Write $f(x) = \ln(x+5)$ as a power series centered at 0.