

TEST 3

=====INSTRUCTIONS=====

- Fill in the above items.
- There is a total of 5 problems, for a maximum possible total value of 60 points (graded out of 55 points). **Make sure you have all 7 test pages (this cover page + 6 test pages)**. You are responsible to check that your test booklet has all 7 pages. Alert a proctor if your copy is missing any pages.
- **Show all your work.** Only minimal credit will be given for answers without supporting work.
- **Write your answer in the box** at the bottom of pages 2-6.
- **Use the back of test pages if additional space is needed**, and for scratch paper.
- **No calculators or other electronic devices; no outside notes; no outside tables** are allowed on this exam. Any use of calculators or electronic devices, or outside notes is a violation of the Academic Integrity Policy.

Do not write below this line

| Pb. # | Max Points | Your Score |
|--------------|------------|------------|
| 1 | 10 | |
| 2 | 10 | |
| 3 | 15 | |
| 4 | 20 | |
| 5 | 5 | |
| Total | (55) | |

1. (10 pts)

(a) Find the general form for a_n for the following sequence:

$$\left\{ 2, -1, \frac{1}{2}, -\frac{1}{4}, \dots \right\}$$

(b) Determine whether the sequence from part (a) converges or diverges. If it converges, find the limit. If it diverges to $\pm\infty$, say so.

2. (15 pts) Determine whether the following series converge or diverge. If they converge, find what they converge to. Name any tests you use, and be sure to check that they apply.

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

(b)
$$\sum_{n=1}^{\infty} [\sqrt{n} - \sqrt{n-1}]$$

3. (10 pts) Determine if the following series converge or diverge. Name any tests you use, and be sure to check that they apply.

(a)
$$\sum_{n=4}^{\infty} \frac{e^{-\sqrt{n}}}{\sqrt{n}}$$

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

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

4. (10 pts) Determine if the following series converge absolutely, converge conditionally, or diverge. Name any tests you use, and be sure to check that they apply.

(a)
$$\sum_{n=1}^{\infty} \frac{(-1)^n 100^n}{(2n)!}$$

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

4. Determine whether the following series converge absolutely, converge conditionally, or diverge (continued).

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

(d)
$$\sum_{n=2}^{\infty} \frac{(1+3n)^n}{(2n)^n}$$

5.(Bonus) Prove that the series

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

converges to $\frac{1}{3}$.