Name: _____

- This packet is due at **12:00 pm PDT (noon) on Friday, April 23**.
- Neatly fill out this packet either directly or on your own paper. Then upload your answers to Canvas. Please clearly number each problem and keep them in order.
- For each problem in this packet, **organize and show all of your work and justification** for your answer.
- Make sure that it is clear what your final answer is. This may mean boxing/circling it or it may mean doing neither.
- If you are required to draw a graph of a function, each axis must be labeled and given a scale.
- I will not be grading every individual problem, but answers will be available on Canvas after the due date.
- I am happy to help you however I can. Here are some options:
  - Come to my office hours (see syllabus).
  - Email me directly at gknapp4@uoregon.edu

1. Use the sequence of partial sums to determine whether the series converges or diverges.

   (a) $\sum_{n=0}^{\infty} \frac{n}{2}$

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

2. Determine whether the geometric series is convergent or divergent. If it is convergent, find its sum.

(a) $4 + 3 + \frac{9}{4} + \frac{27}{16} + \cdots$

(b) $\sum_{n=0}^{\infty} \frac{\pi^n}{3^{n+1}}$

(c) $10 - 2 + 0.4 - 0.08 + \cdots$

(d) $\sum_{n=0}^{\infty} \frac{1}{(\sqrt{2})^n}$

3. Use a geometric series to demonstrate that $0.\overline{9} = 0.9999999\ldots$ is equal to 1.

4. Determine whether the series is convergent or divergent by expressing s_n as a telescoping sum. If it is convergent, find its sum.

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

   (b) $\sum_{n=1}^{\infty} \ln\left(\frac{n}{n+1}\right)$

5. For each of the following series, apply the divergence test. State whether or not the divergence test allows you to make a conclusion about the convergence of the series. You don't have to compute any of the sums; just tell me the result of applying the divergence test.

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

   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{(3n-2)(n+7)}{n^2+2n-1}$

   (c) $\displaystyle\sum_{n=0}^{\infty} \frac{2^n}{3^{n/2}}$

   (d) $\displaystyle\sum_{n=0}^{\infty} e^{-n^3}$

(e) $\sum_{n=1}^{\infty} e^{-5/n}$

(f) $\sum_{n=0}^{\infty} \sin(n)$

(g) $\sum_{n=1}^{\infty} \frac{1-\cos(2/n)}{\sin(1/n)}$

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

6. Determine whether the series is convergent or divergent. If it is convergent, find its sum.

(a) $\sum_{k=2}^{\infty} \frac{k^2}{k^2-1}$

(b) $\sum_{n=1}^{\infty} \cos(\frac{1}{n})$

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

(d) $\sum_{k=1}^{\infty} (\cos(1))^k$

7. Put one checkmark in each row according to how you feel about each vocab word. This is merely graded for completion and I will not judge you in the slightest for checking "no idea." Just make sure to learn the vocab before the exam!

Vocab Term	**Can Define**	**Have Seen**	**No Idea**
infinite sequence			
explicit form			
recursive form			
index variable			
arithmetic sequence			
geometric sequence			
Fibonacci sequence			
bounded from above			
bounded from below			
bounded			
increasing after n_0/eventually increasing			
decreasing after n_0/eventually decreasing			
monotone after n_0/eventually monotone			
sequence convergence/limit of a sequence			
diverge			
diverge to ∞			
diverge to $-\infty$			
Squeeze Theorem			
Algebraic Limit Laws			
Continuous Functions Defined on Convergent Sequences Theorem			
Monotone Convergence Theorem			
infinite series			
terms/summands			
partial sums			
series convergence/sum of a series			
geometric series			
Algebraic Properties of Convergent Series Theorem			
telescoping series			