Name: _____

- This packet is due at **12:00 pm PDT (noon) on Friday, April 30**.
- 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 limit comparison test to determine whether each of the following series converges or diverges.

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

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

(c) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{\ln(n)}{n}\right)^2$

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

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

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

2. State whether the following series converges absolutely, conditionally, or not at all.

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

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

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

(d) $\displaystyle\sum_{n=1}^{\infty}\frac{\cos(n\pi)}{n}$

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

(f) $\displaystyle\sum_{n=1}^{\infty}(-1)^{n+1}2^{1/n}$

3. In each of the following problems, use the estimate $|R_k| \leqslant b_{k+1}$ to find a value of k that guarantees that the sum of the first k terms of the alternating series $\sum_{n=1}^{\infty} (-1)^{n+1} b_n$ differs from the infinite sum by at most the given error. Calculate the partial sum S_k for this k.

   (a) $b_n = 1/\sqrt{n}$, error $< 10^{-3}$

   (b) $b_n = 1/2^n$, error $< 10^{-6}$

(c) $b_n = \ln\left(1 + \frac{1}{n}\right)$, error $< 10^{-3}$

(d) $b_n = 1/n^2$, error $< 10^{-6}$

4. Suppose that a_n is a sequence of positive real numbers and that $\sum_{n=1}^{\infty} a_n$ converges. Suppose that b_n is an arbitrary sequence of ones and minus ones. Does $\sum_{n=1}^{\infty} a_n b_n$ necessarily converge?