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. State whether the given p-series converges.

   (a) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n^2}}$

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

2. Use the integral test to determine whether the following sums converge.

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

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

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

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

3. Use your favorite technological tool (e.g. Wolfram|Alpha) to compute the given partial sum. If you are using Wolfram|Alpha to compute $\sum_{n=n_0}^{\infty} a_n$, you can type in the phrase "sum from $n = n_0$ to infinity of a_n" and it should do the computation for you. Next, use the estimate $R_N \leqslant \int_N^{\infty} f(x)\, dx$ to find a bound for the remainder.

   (a) $\sum_{n=1}^{1000} \frac{1}{n^3}$

   (b) $\sum_{n=1}^{100} ne^{-n}$

4. Find the minimum value of n_0 such that the remainder estimate $R_{n_0} < \int_{n_0}^{\infty} f(x)\,dx$ guarantees that $\sum_{n=1}^{n_0} a_n$ estimates $\sum_{n=1}^{\infty} a_n$ within the given level of accuracy. Then compute the estimate $\sum_{n=1}^{n_0} a_n$.

   (a) $a_n = \dfrac{1}{n^{1.2}}$, with error less than 0.1

   (b) $a_n = \dfrac{1}{1+n^2}$, with error less than 10^{-6}

5. Find the values of p for which the series $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^p}$ is convergent.

6. Use the direct comparison test to determine whether each of the following series converge.

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

(b) $\displaystyle\sum_{n=2}^{\infty} \frac{n^3}{n^4-1}$

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

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