9.4 Series
Group Work Target Practice

1. Go through each and every one of our series tests in 9.2–9.4, as well as the conditions for the tests, and write down whether each can be applied or not, and if so, whether the test determines convergence. Show work/reasoning: $\sum_{n=1}^{\infty} \frac{n^2}{n^3+6}$

   (a) Is this a geometric series? yes no

   (b) Can we apply the Terms not Getting Smaller? yes no

   (c) Are the terms decreasing and positive eventually, and if so is this an integral we can do? yes no

   (d) Are the terms positive, and if so, can we directly compare the series with another (smaller than a convergent series, larger than a divergent series)? yes no

   (e) Are the terms positive, and if so, can we limit compare the series with another to obtain $0 < \lim_{n->\infty} \frac{a_n}{b_n} < \infty$? yes no

   (f) Does the ratio test give us $L < 1$ or $L > 1$? yes no

   (g) Is this an alternating series? yes no If so, can we make use of
   the alternating series test yes no
   or absolute value test yes no

Given the following sequences and series, determine if they converge or diverge and EXPLAIN or SHOW WORK documenting why your answer is correct. If more than one test applies, choose whichever you prefer. List the test you use and document why it works.

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

3. $\displaystyle\sum_{n=0}^{\infty}\frac{n}{n!}$

4. $\displaystyle\sum_{n=1}^{\infty}\left(\frac{1+n}{2n}\right)^n$. Hint: $\lim_{n\to\infty}\left(\frac{1+n}{n}\right)^n = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$.

5. $a_i = \dfrac{1}{i}$

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

7. Find an estimate of $\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^2}$ to within 0.01, if it converges.