Rutgers University
Math 152

Section 10.6: Alternating Series & Conditional Convergence - Worksheet

1. Determine if the series below converge absolutely, converge conditionally or diverge. Make sure to clearly label and justify the use of any convergence test used. **Note:** some of these problems require convergence tests from previous sections.

   (a) $\displaystyle\sum_{n=3}^{\infty} \frac{(-1)^n}{n\log_2(n)}$

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

   (c) $\displaystyle\sum_{n=0}^{\infty} \frac{n\arctan(n)}{\sqrt[3]{8n^6+1}}$

   (d) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{3^n+\cos(n)}$

   (e) $\displaystyle\sum_{n=2}^{\infty} \frac{\sec(\pi n)}{\sqrt{n}}$

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

   (g) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{e^{\sqrt{n}}}$

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

   (i) $\displaystyle\sum_{n=3}^{\infty} \cos\left(\frac{\pi}{n}\right)^{n^2}$

2. Consider the series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt[3]{7n+4}}$.

   (a) Show that this series meets the conditions of the Alternating Series Estimation Theorem.

   (b) Find the smallest integer N for which the partial sum $S_N = \displaystyle\sum_{n=1}^{N} \frac{(-1)^n}{\sqrt[3]{7n+4}}$ approximates the sum of the series with an error of at most 0.1.

3. Consider the series $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{2^{3n-7}+9}$.

   (a) Show that this series meets the conditions of the Alternating Series Estimation Theorem.

   (b) Find the smallest integer N for which the partial sum $S_N = \displaystyle\sum_{n=0}^{N} \frac{(-1)^{n+1}}{2^{3n-7}+9}$ approximates the sum of the series with an error of at most 10^{-3}.