HW3B. Written Homework 3B. Alternating Series Test. **Due Week 3 Friday 11:59PM**

Name:

Instructions: Upload a pdf of your submission to **Gradescope**. This worksheet is worth 20 points: up to 8 points will be awarded for accuracy of certain parts (to be determined after the due date) and up to 12 points will be awarded for completion of parts not graded by accuracy.

(1) Use the **Alternating Series Test (AST)** to determine the convergence of the following series. If AST can be applied, explicitly show that the conditions on $\sum_{n=1}^{\infty}(-1)^{n-1}b_n$ or $\sum_{n=1}^{\infty}(-1)^n b_n$ are satisfied. If AST cannot be applied, state at least one condition that is not satisfied.

Note that there may be other methods to determine the convergence of the following series. However, this problem tests your knowledge and understanding of the Alternating Series Test.

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

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

(c) $\displaystyle\sum_{n=0}^{\infty}\frac{\sin(\pi n+\frac{\pi}{2})}{1+\sqrt{n}}$

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

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

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

(2) Determine if the following series are either **divergent**, **conditionally convergent**, or **absolutely convergent**. You can use any test as appropriate.

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

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

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{\sin(\pi n + \frac{\pi}{2})}{1+\sqrt{n}}$

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

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

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

(3) Find an approximation A of $S = \displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^6}$ accurate to 3 decimal places.

The accuracy claim must be justified using some approximation error theorem.