**Math 101 – WORKSHEET 28**
**ABSOLUTE CONVERGENCE**

## 1. More Tail Estimates

(1) It is known that $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \cdots = \log 2$. How many terms are needed for the error to be less than 0.01?

(2) It is known that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \cdots = \frac{\pi}{4}$. How many terms are needed for the error to be less than 0.001?

## 2. Convergence

(3) Which of the following converges:

$$\square \left\{ \frac{1}{\sqrt{n}} \right\}_{n=1}^{\infty} \quad \square \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \quad \square \left\{ \frac{(-1)^n}{\sqrt{n}} \right\}_{n=1}^{\infty} \quad \square \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$$

(4) Place checkmarks

| | Converges | | Diverges |
|---|---|---|---|
| | Absolutely | Conditionally | |
| $\sum_{n=1}^{\infty} (-1)^n$ | | | |
| $\sum_{n=1}^{\infty} \frac{1}{n^2}$ | | | |
| $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ | | | |
| $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$ | | | |
| $\sum_{n=1}^{\infty} \frac{\sin n}{n^2}$ | | | |
| $\sum_{n=1}^{\infty} \frac{\sin n}{n}$ | | | |

*Date*: 17/3/2017, Worksheet by Lior Silberman. This instructional material is excluded from the terms of UBC Policy 81.

## 3. Ratio test

(5) Decide whether the following series converge:

(a) $\sum_{n=0}^{\infty} \frac{n}{2^n}$

(b) $\sum_{n=0}^{\infty} \frac{n!}{2^n}$

(c) $\sum_{n=0}^{\infty} \frac{2^n}{n!}$

(d) For which values of $x$ does $\sum_{n=0}^{\infty} nx^n$ converge?