

## Math 301 — Infinite series, continued

**Problem 1.** For each of the following series, explain whether it converges or diverges. If it converges, explain whether it converges absolutely or converges conditionally. Take as given that the series  $\sum_{n=1}^{\infty} 1/n^p$  converges if and only if  $p > 1$ .

a.  $\sum_{n=1}^{\infty} \frac{\sin(n)}{n^2}$

b.  $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$

c.  $\sum_{n=1}^{\infty} (-1)^n$

d.  $\sum_{n=1}^{\infty} (-1/2)^n$

**Problem 2.** For each of the following statements, determine whether it is true or false and explain why.

a. If  $\sum_{k=1}^{\infty} a_k$  converges, then  $\sum_{k=1}^{\infty} |a_k|$  converges.

b. If  $\sum_{k=1}^{\infty} a_k$  converges and  $\sum_{k=1}^{\infty} b_k$  converges, then  $\sum_{k=1}^{\infty} a_k b_k$  converges.

c. If  $\sum_{k=1}^{\infty} a_k$  converges absolutely, then  $\sum_{k=1}^{\infty} a_k^2$  converges.

d. If  $\sum_{k=1}^{\infty} a_k$  converges absolutely and  $\sum_{k=1}^{\infty} b_k$  converges absolutely, then  $\sum_{k=1}^{\infty} a_k b_k$  converges.