

1. True or False. Answer and briefly justify in each case (2pts each).

(a) If  $\lim_{k \rightarrow +\infty} a_k = 5$  then the series  $\sum_{k=1}^{\infty} a_k$  is convergent to 5.

(b) If  $\sum_{k=1}^{\infty} a_k = 5$  then  $\lim_{k \rightarrow +\infty} a_k = 0$ .

(c) If  $S_n = \sum_{k=1}^n a_k$  and  $\lim_{n \rightarrow \infty} S_n = 5$ , then  $\sum_{k=1}^{\infty} a_k = 5$ .

(d) The series  $5 - 5 + 5 - 5 + 5 - 5 + \dots$  is divergent.

(e) If  $\sum_{k=1}^{\infty} a_k = 5$  and  $\sum_{k=1}^{\infty} b_k = 5$  then  $\sum_{k=1}^{\infty} (2a_k - b_k) = 5$ .

2. Determine if each of the following series is convergent or divergent. Justify your answer (2.5pts each)

(a)  $\sum_{k=1}^{\infty} \frac{1}{\sqrt{k}}$

(b)  $\sum_{k=2}^{\infty} \frac{1}{k \ln k}$

(c)  $\sum_{k=1}^{\infty} \frac{1}{\sqrt[k]{\pi}}$

(d)  $\sum_{k=2}^{\infty} \frac{1}{k^2 - 1}$