

Name:

1. (3pts) Determine (and justify!) whether the sequence is convergent and divergent, and give the limit if it converges.

$$a_n = \frac{n + \cos\left(\frac{1}{n}\right)}{n \cos(\pi n) + \sin\left(\frac{1}{n}\right)}$$

2. (3pts) Determine whether the series  $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$  is convergent or divergent.

3. (4pts) Determine whether the statement true or false. If false give a counterexample.

(a) (2pts)  $\lim_{n \rightarrow \infty} a_n = 1$ , then  $\lim_{n \rightarrow \infty} a_{n+100} = 1$

(b) (2pts)  $\lim_{n \rightarrow \infty} a_n = 0$ , then  $\sum_{n=1}^{\infty} a_n$  converges.