

Full name(s): \_\_\_\_\_ .

*Questions*

1. Classify each of the following sequences as 1) divergent to  $\infty$ , 2) oscillatory divergent, or 3) convergent to a limit  $L$ . If the sequence is convergent, find the limit.

(a)  $s_n = \frac{1+1/n}{n}$

(b)  $s_n = (-2)^n$

(c)  $s_n = (-.9)^n$

(d)  $s_n = \frac{n^2+1}{2+2n^2}$

(e)  $s_n = \sqrt{n+2} - \sqrt{n+1}$

(f)  $s_n = \sin(\sqrt{n})$

(g)  $s_n = (1 + \frac{1}{2n})^n$

(h)  $s_n = n \sin(1/n)$

(i)  $s_n = \sqrt{n} \sin(1/n)$

(j)  $s_n = n^2 \sin(1/n)$

2. Show using  $\epsilon$  calculus that  $s_n = 1 + 1/n$  is Cauchy. This implies it has a limit, what is the limit? Prove the limit using  $\epsilon$  calculus.

3. Evaluate the following series:

(a)  $\sum_{k=0}^{\infty} .9^k$

(b)  $\sum_{k=0}^{\infty} \pi^{-k}$

(c)  $\sum_{k=0}^{\infty} 10^{-2k}$

(d)  $\sum_{k=1}^{\infty} \frac{1}{e^{3k}}$