

The University of Waikato  
Department of Mathematics

Elements of Analysis math252-09B 2009 Assignment 2

Due Friday 7th August: Please hand back your completed assignment through the slot for this paper outside the Mathematics Office G3.19.

It should be written up neatly and on no more than four sides of an A4 page or the equivalent.

1. Show that

$$\lim_{n \rightarrow \infty} \frac{\log(n^{100})}{n} = 0.$$

(This shows that the log function grows very slowly.)

2. Use the limit theorem and useful limits to evaluate

$$\lim_{n \rightarrow \infty} \left[ (2n)^{\frac{1}{n}} + 5 \left( 1 + \frac{1}{2n} \right)^{4n} \right].$$

3. Sum the following series to 3 terms, to  $n$  terms and to infinity by finding the limit of the sequence of partial sums:

$$\sum_{n=1}^{\infty} \left( 2 \frac{3^{n+1}}{5^n} \right).$$

(Hint: its a geometric series in disguise.)

4. Test the following series for divergence, by taking the limit of the  $n$ 'th term as  $n \rightarrow \infty$ :

$$\sum_{n=1}^{\infty} \left[ \frac{n^3 - 3n + 2}{n(n+1)(n+2)} + \frac{1}{n^3} \right].$$

Kevin Broughan  
29th July 2009