## MMAT5000 Homework 1

- (0) Study the text book covering all topics which have been discussed in class up to 10 September 2014.
- (1) Do Problem 1, Exercise 1.34, of the textbook.
- (2) (Optional) Do Problem 4, Exercise 1.34, of the textbook.
- (3) Use the  $\epsilon N$  method, prove the following assertions. What is your N when  $\epsilon = 0.1$ ?
  - (i)  $\lim_{n \to \infty} n^{1/n} = 1.$
  - (ii) (Optional)  $\lim_{n \to \infty} \frac{n!}{n^n} = 0.$
- (4) Let c be a positive number. For each of the following sequences, determine whether it converges to a real number, diverges to  $\infty$  or  $-\infty$ , or neither. Is it Cauchy?
  - (i)  $a_1 = c$ ,  $a_{n+1} = \sqrt{2a_n}$  for all  $n \ge 1$ .
  - (ii) (Optional)  $a_1 = c$ ,  $a_{n+1} = \sqrt{2 + a_n}$  for all  $n \ge 1$ .
  - (ii) (Optional)  $a_1 = c$ ,  $a_{n+1} = 1 + \frac{1}{1+a_n}$  for all  $n \ge 1$ .