Assignment 3
Analysis I
Daniel Ueltschi

Due: Monday 26 October, 3:00pm.

1. Prove that each of the following sequences tends to infinity
    a. $a_n = n + 10$
    b. $a_n = \sqrt{n} + \sin n$
    c. $a_n = 2^{\sqrt{n}}$

2. Prove that none of the following sequences tends to infinity
    a. $a_n = 40 - \frac{1}{n}$
    b. $b_n = \cos(n^2 + 7)$
    c. $c_n = 2^{\sin(n\pi)}$

3. Prove that a sequence which is bounded above cannot tend to infinity.

4. A sequence is known to be increasing.
    (a) Might it have an upper bound?
    (b) Might it have a lower bound?
    (c) Must it have an upper bound?
    (d) Must it have a lower bound?

5. Prove
    (i) Sum Rule
    (ii) Product Rule
    (iii) Quotient Rule
    for sequences.

6. Find the limit of the sequences defined below
    a. $\frac{7n^2 + 8}{4n^2 - 3n}$
    b. $\frac{2^n + 1}{2^n - 1}$
    c. $\frac{(\sqrt{n} + 3)(\sqrt{n} - 2)}{4\sqrt{n} - 5n}$
    d. $\frac{1 + 2 + .. + n}{n^2}$