RECURRENCE RELATIONS **SET 1**

1 *(a)* Calculate the values of $u_1, u_2, \ldots, u_5$ for these recurrence relations:

(i) $u_o = 4 \qquad u_{n+1} = 2u_n - 3$

(ii) $u_o = 64 \qquad u_{n+1} = \frac{1}{2}u_n$

(iii) $u_o = 81 \qquad u_{n+1} = -\frac{1}{3}u_n$

(b) For each of the above, explain what happens to u_n as $n \to \infty$.

2 A retired person has £150 000 invested in a pension fund. This fund earns interest at 5% per annum. At the end of each year £15 000 is withdrawn for living expenses for the following year.

Calculate the value of the fund at the end of each year just after the £15 000 has been withdrawn. How many years will the fund last?

3 Find a suitable recurrence relation for these sequences:

(a) 2, 5, 8, 11, 14, … *(b)* 4, 9, 19, 39, 79, …

4 Determine algebraically the limit for these recurrence relations:

(a) $u_o = 40, \quad u_{n+1} = 0.8u_n + 20$ *(b)* $u_o = 4, \quad u_{n+1} = 60 - 0.5u_n$

5 At 12noon, a hospital patient is given a pill containing 50 units of antibiotic. By 1pm the number of units in the patient's body has dropped by 12%. By 2pm a further 12% of the units remaining at 1pm is lost.

If this fall-off rate is maintained, find the number of units of antibiotic remaining at 6pm.

A doctor considers prescribing a course of treatment which involves a patient taking one of these pills every 6 hours over a long period of time.

The doctor knows that more than 100 units of this antibiotic in the body are regarded as too dangerous.

Should the doctor prescribe this treatment? **Give reasons for your answer.**