

Mathematics Department – Langholm Academy

HIGHER HOMEWORK

UNIT 1

CHAPTER 4.1

Sequences

Higher - Unit 1
Sequences

1. Calculate the first 4 terms U_1 to U_4 of the following sequences
 - a. $U_n = 3^n$
 - b. $U_n = 2^n + 1$
 - c. $U_n = 2n^2 - 1$
 - d. $U_n = 12 - 3n$

2. For each recurrence relation explain whether the limit exists and where it does find the value.
 - a. $U_{n+1} = 0.5U_n + 10$
 - b. $U_{n+1} = 2 - 0.3U_n$
 - c. $U_{n+1} = 6U_n - 7$
 - d. $U_{n+1} = U_n + 0.6$
 - e. $3U_{n+1} = 2U_n + 1$
 - f. $5U_{n+1} - 6U_n = 7$

3. A series is defined by the recurrence relation $U_{n+1} = 0.3U_n + 6$ with $U_{10} = 14$. Find the value of U_{12}

4. A series is defined by the recurrence relation $U_{n+1} = 0.6U_n + 10$ with $U_0 = 4$.
 - a. State why this sequence has a limit
 - b. Find the limit.

5. A recurrence relation is defined by $U_{n+1} = pU_n + q$ with $-1 < p < 1$ and $U_0 = 12$.
 - a. If $U_1 = 15$ and $U_2 = 16$ find the values of p and q
 - b. Find the limit as $n \rightarrow \infty$

6. In a wasp nest 15% of the wasps die each day, and 120 new wasps are born daily. If the nest starts with 700 wasps what is its final size?

7. A car tyre is only safe if the pressure in it doesn't fall below 18 psi. The tyre is initially inflated to 30 psi, before it develops a slow leak and loosing 34% of its air pressure each day.
 - a. If the driver tops up the tyre by 6 psi each day will the tyre remain safe to drive?
 - b. What will the driver have to top up by if he wants to ensure the pressure doesn't fall below 25 psi?