



Recurrence Relations – Questions

Q1) For each of the following recurrence relations calculate the indicated terms of the sequence.

a) $u_{n+1} = 2u_n + 1, u_0 = 1$ u_1 & u_3

b) $u_{n+1} = \frac{1}{2}u_n + 2, u_0 = 2$ u_2 & u_4

Q2) Determine the recurrence relations that generates the following sequences of numbers.

a) 4, 8, 12, 16, 20, ...

c) 7, 10, 13, 16, 19, ...

b) 6, 11, 16, 21, 26, ...

d) -7, -4, -1, 2, 5, ...

Q3) Determine whether or not the following sequences has a limit and, if so, find it.

a) $u_{n+1} = 3u_n + 1$

c) $u_{n+1} = \frac{3}{2}u_n - 1$

b) $u_{n+1} = 0.2u_n - 3$

d) $u_{n+1} = -0.9u_n + 1$

Q4) A farmer is trying two new pesticide sprays in his field. Pesticide A claims to remove 60% of pests. Between sprays the farmer noticed that 450 new pests appeared in his field. Pesticide B claims 75% of pests will be removed. Between sprays the farmer noticed that 550 new pests appeared in his field. Determine which pesticide will be most effective in the long term?

Q5) A patient is given 50ml of medication of which 16% leaves her bloodstream every 24 hours. To compensate for this, she's given a 25ml booster every day. It's know that particular medication can be dangerous if levels in the bloodstream reach 150ml. Is this medication is safe for her to continue using in this manner?



Recurrence Relations - Solutions

Q1) a) $u_1 = 3$

$$u_3 = 15$$

b) $u_2 = 4.5$

$$u_4 = 4.125$$

Q2) a) $u_{n+1} = u_n + 4, u_0 = 4$

c) $u_{n+1} = u_n + 3, u_0 = 7$

b) $u_{n+1} = u_n + 5, u_0 = 6$

d) $u_{n+1} = u_n + 3, u_0 = -7$

Q3) a) This sequence has a limit since $-1 < a < 1$, Limit = $\frac{4}{7}$

b) This sequence has a limit since $-1 < a < 1$, Limit = -3.75

c) This sequence does not have a limit since a does not lie between -1 & 1

d) This sequence has a limit since $-1 < a < 1$, Limit = 0.53

Q4) Limit for Pesticide A = 750. Limit for Pesticide B = 600

So, in the long run, Pesticide B is going to be more effective.

Q5) Limit = 156.25

Since the limit is more than 150, it would be dangerous to continue with the medication.