

Linear Recurrence Relation Examples

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Graduate Bsc (Hons) MathsSci (Open) GIMA

1. For the following linear recurrence relation

$$U_{n+1} = 0.5 U_n + 2$$

Does it have a limiting value, if yes explain why and calculate its value?

Solution

The relation does have a limiting value since $|m|=0.5$ which is less than 1. The value is given by

$$L = \frac{2}{(1 - 0.5)}$$

$$L = 4$$

2. During the day a taxi uses 40% of its available diesel. At the end of the day the driver tops up the diesel tank making a further 4 litres available. With 20 litres initially in the tank how much will be in the tank in the long term.

Solution

$$U_{n+1} = 0.6 U_n + 4 \quad \text{where} \quad U_1 = 20$$

$$L = \frac{c}{(1 - m)} = \frac{4}{(1 - 0.6)} = 10 \text{ litres}$$