To find l

we have

$$x_3 = \frac{1}{2}(x_1 + x_2)$$

$$x_4 = \frac{1}{2}(x_2 + x_3)$$

$$x_5 = \frac{1}{2}(x_3 + x_4)$$

$$\ldots \ldots$$

$$x_k = \frac{1}{2}(x_{k-2} + x_{k-1})$$

On adding,

$$x_3 + x_4 + x_5 + \cdots + x_k = \frac{1}{2}x_1 + [x_2 + x_3 + \cdots + x_{k-2}] + \frac{1}{2}x_{k-1}$$

we get

$$\frac{1}{2}x_{k-1} + x_k = \frac{1}{2}x_1 + x_2 = \frac{1}{2}\cdot 1 + 2 = \frac{5}{2}$$

take the limit as $k \to \infty$

$$\Rightarrow \frac{1}{2}l + l = \frac{5}{2} \Rightarrow \frac{3l}{2} = \frac{5}{2} \Rightarrow l = \frac{5}{3}$$

$\therefore$ the given seq. Converges to $\frac{5}{3}$

Q. 10 / P. 86 Ex 3.5 (Bartle)

If $x_1 < x_2$ & $x_n = \frac{1}{2}(x_{n-2} + x_{n-1})$, $n > 2$
Show that (x_n) is Cgt & find its limit.

Sol^n: This question Can be done using Subseq. method, similar to the above exp.
or Can be done using Cauchy method.