

Solutions to Attendance Quiz for Lecture 11 of Dr. Z.'s Dynamical Models in Biology class

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1.: Find the steady-states of the second-order recurrence

$$a(n+2) = \frac{1 + a(n+1) + a(n)}{2 + 3a(n+1) + 2a(n)} \quad .$$

1.: We replace $a(n), a(n+1), a(n+2)$ by z getting the equation

$$z = \frac{1 + z + z}{2 + 3z + 2z} \quad .$$

Simplifying

$$z = \frac{1 + 2z}{2 + 5z} \quad .$$

Hence

$$z(5z + 2) - (2z + 1) = 0 \quad .$$

Expanding

$$5z^2 - 1 = 0 \quad .$$

Hence

Ans. to 1: The two steady-states are $z = -\frac{\sqrt{5}}{5}$ and $z = \frac{\sqrt{5}}{5}$.