

Homework #11

$$2.) \quad a(n+3) = \frac{1 + 2a(n+2) + 3a(n+1) + 4a(n)}{2 + 3a(n+2) + 4a(n+1) + 5a(n)}$$

Finding Steady States -

$$z = \frac{1 + 2z + 3z + 4z}{2 + 3z + 4z + 5z} \Rightarrow z(12z + 2) = 1 + 9z$$

$$12z^2 - 7z - 1 = 0 \Rightarrow z = \frac{-7 \pm \sqrt{49 - 48}}{24} = -\frac{1}{3}, -\frac{1}{4}$$

$$3.) \quad a(n+3) = \frac{1 + 2a(n+2) + 3a(n+1) + 4a(n)}{2 + 3a(n+2) + 4a(n+1) + 5a(n)}$$

$$f(x_1, x_2, x_3) = \frac{1 + 2x_1 + 3x_2 + 4x_3}{2 + 3x_1 + 4x_2 + 5x_3}$$

$$\vec{x}(n+1) = \begin{bmatrix} (1 + 2x_1 + 3x_2 + 4x_3) / (2 + 3x_1 + 4x_2 + 5x_3) \\ x_1 \\ x_2 \end{bmatrix}$$

$$4.) \quad a(n+1) = (1 - 2a(n))(1 - 3a(n))$$

Steady States: $\frac{r+5+\sqrt{r^2+10r+1}}{12}, \frac{r+5-\sqrt{r^2+10r+1}}{12}$

$r_0 \approx 3.4306$ s.t. $\forall r > r_0 \exists$ one SSS

$$5.) \quad r_1 \approx 2, \quad r_2 \approx 1.9, \quad r_3 \approx 1.85$$