

$$\textcircled{1} \quad x = \frac{5}{2} x (1-x)$$

$$0 = x(\frac{3}{2} - \frac{5}{2}x) \quad \text{steady states} = 0, \frac{3}{5}$$

stability:

$$f(x) = \frac{5}{2} x (1-x) \Rightarrow \frac{5}{2} x - \frac{5}{2} x^2$$

$$f'(x) = \frac{5}{2} - 5x \quad f'(0) = 2.5 \quad \text{unstable}$$

$$f'(x) = \frac{5}{2} - 5x \quad f'(\frac{3}{5}) = 0.5 \quad \text{stable}$$

$$0 \begin{cases} (0.01) \rightarrow 0.5 \\ (-0.01) \rightarrow \text{approach } 0 \end{cases} [1-10]$$

$$0.6 \begin{cases} (0.59) \rightarrow 0.6 \\ (0.61) \rightarrow 0.6 \end{cases}$$

$$b. \quad \frac{29}{10} x(n) (1-x(n)) = x(n+1)$$

$$\frac{29}{10} x(1-x) = x(\frac{19}{10} - \frac{29}{10}x) \quad x=0, \frac{19}{29}$$

$$f'(x) = \frac{29}{10} - \frac{29}{5}x$$

$$f'(0) = 2.9 \quad \text{unstable}$$

$$f'(\frac{19}{29}) = -0.899 \quad \text{stable}$$

$$0 \begin{cases} (0.01) \rightarrow 0.5 \\ (-0.01) \rightarrow 0 \end{cases}$$

$$\frac{19}{29} \begin{cases} (0.656) \rightarrow 0.656 \\ (0.655) \rightarrow 0.656 \end{cases}$$

$$c. \quad x(n+1) = \frac{31}{10} x(n) (1-x(n)) \quad x(\frac{21}{10} - \frac{31}{10}x) \quad x=0, \frac{21}{31}$$

$$f'(x) = \frac{21}{10} - \frac{31}{5}x$$

$$f'(0) = 2.1 \quad \text{unstable}$$

$$f'(\frac{21}{31}) = 1.1 \quad \text{unstable}$$

$$0 \begin{cases} (0.01) \rightarrow 0.5 \\ (-0.01) \rightarrow 0 \end{cases}$$

$$\frac{21}{31} \begin{cases} (0.678) \rightarrow 0.678 \\ (0.677) \rightarrow 0.677 \end{cases}$$

$$2a. \quad \frac{1}{5} x^3 - \frac{6}{5} x^2 + \frac{16}{5} x - \frac{6}{5}$$

$$f'(x) = \frac{3}{5} x^2 - \frac{12}{5} x + \frac{16}{5}$$

$$f(1)=1, f(2)=2, f(3)=3$$

$$f'(1)=1.4 \quad \text{unstable}$$

$$f'(2)=0.8 \quad \text{stable}$$

$$f'(3)=1.4 \quad \text{unstable}$$

$$2b. \quad \frac{1}{8} x^3 - \frac{5}{4} x^2 + \frac{39}{8} x - \frac{15}{4}$$

$$f'(x) = \frac{3}{8} x^2 - \frac{5}{2} x + \frac{39}{4}$$

$$f(2)=2, f(3)=3, f(5)=5$$

$$f'(2)=1.375 \quad \text{unstable}$$

$$f'(3)=0.75 \quad \text{stable}$$

$$f'(5)=1.75 \quad \text{unstable}$$

$$2a. \quad 1 \begin{cases} (1.1) = 1.1 \rightarrow 1.5 \\ (0.9) = 0.9 \rightarrow 0 \end{cases}$$

$$2 \begin{cases} (2.1) = 2.1 \\ (1.9) = 1.9 \end{cases}$$

$$3 \begin{cases} (3.1) = 3.1 \rightarrow 2 \times 10^{16} \\ (2.9) = 2.85 \rightarrow 2.28 \end{cases}$$

$$2b. \quad 2 \begin{cases} (2.1) = 2.1 \rightarrow 2.8 \\ (1.9) = 1.8 \rightarrow -1.8 \times 10^7 \end{cases}$$

$$3 \begin{cases} (3.1) = 3.1 \\ (2.9) = 2.9 \end{cases}$$

$$5 \begin{cases} (5.1) = 5.1 \rightarrow 1 \times 10^{16} \\ (4.9) = 4.8 \rightarrow 2.22 \end{cases}$$