

$$\textcircled{1} \quad v_{\text{right}} = (0 \cdot x^0) + (0 \cdot x^1) + (0 \cdot x^2) + (1 \cdot x^3) = 1 \cdot x^3$$

$$v_{\text{left}} = (0 \cdot x^0) + (10 \cdot x^1) = 10x$$

$$10x = 1x^3$$

$$x^2 = 10$$

$$x = \sqrt{10}$$

$$\textcircled{2} \quad 1. \quad P(X_1 = 1) = 2/3$$

$$P(X_1 = 2) = 1/3$$

$$P(X_2 = 1) = 11/18$$

$$P(X_2 = 2) = 7/18$$

$$P(X_2 = 1) = P(X_1 = 2) \cdot P(X_2 = 1 | X_1 = 2) + P(X_1 = 1) \cdot P(X_2 = 1 | X_1 = 1)$$

$$= 1/3 \cdot 1/2 + 2/3 \cdot 2/3 = 11/18$$

$$P(X_2 = 2) = P(X_1 = 2) \cdot P(X_2 = 2 | X_1 = 2) + P(X_1 = 1) \cdot P(X_2 = 2 | X_1 = 1)$$

$$= 2/3 \cdot 1/3 + 1/3 \cdot 1/2 = 7/18$$

$$2. \quad P(X_{\infty} = 1) = 3/5$$

$$P(X_{\infty} = 2) = 2/5$$

$$P(X_{\infty} = 1) = P(X_{\infty-1} = 1) \cdot P(X_{\infty} = 1 | X_{\infty-1} = 1) +$$

$$+ P(X_{\infty-1} = 2) \cdot P(X_{\infty} = 1 | X_{\infty-1} = 2)$$

$$P(X_{\infty} = 1) = P(X_{\infty} = 1) \cdot P(X_i = 1 | X_{i-1} = 1) +$$

$$+ P(X_{\infty} = 2) \cdot P(X_i = 1 | X_{i-1} = 2)$$

$$\frac{1}{3} P(X_{\infty} = 1) = \frac{1}{2} P(X_{\infty} = 2)$$

$$P(X_{\infty} = 2) + P(X_{\infty} = 1) = 1$$