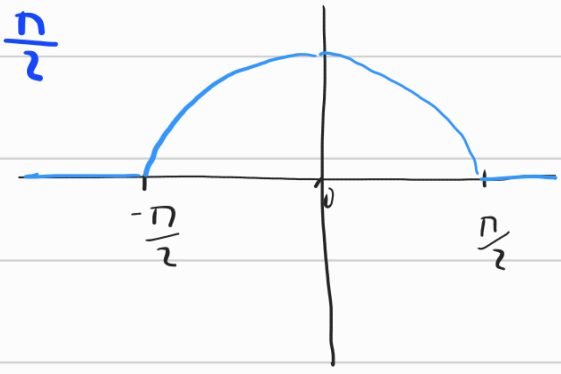
Assignment 2

(3)

Continuous distribution with density:

(PDF) $\rho(x) = \frac{1}{2} \cdot \cos(x)$; $\frac{-\pi}{2} < x < \frac{\pi}{2}$



a) Distribution function F (CDF)

$$CDF \rightarrow F(x) = \int_{-\infty}^{x} \rho(t) \cdot dt$$

$$\boxed{F(x) = \int_{\frac{-\pi}{2}}^{x} \frac{1}{2} \cdot \cos(t) \cdot dt = \frac{1}{2} \cdot \left[\sin(x) - \overset{-1}{\sin\left(\frac{-\pi}{2}\right)} \right] = \frac{1}{2} \cdot (\sin(x) + 1)}$$

b) Inverse distribution function F^{-1}

$$F(x) = \frac{1}{2}(\sin(x) + 1) = y \rightarrow 2y - 1 = \sin(x) \rightarrow x = \arcsin(2y - 1)$$

$$\boxed{F^{-1}(y) = \arcsin(2y - 1)}$$

$$\frac{-\pi}{2} < x < \frac{\pi}{2}$$

$$0 < y < 1$$

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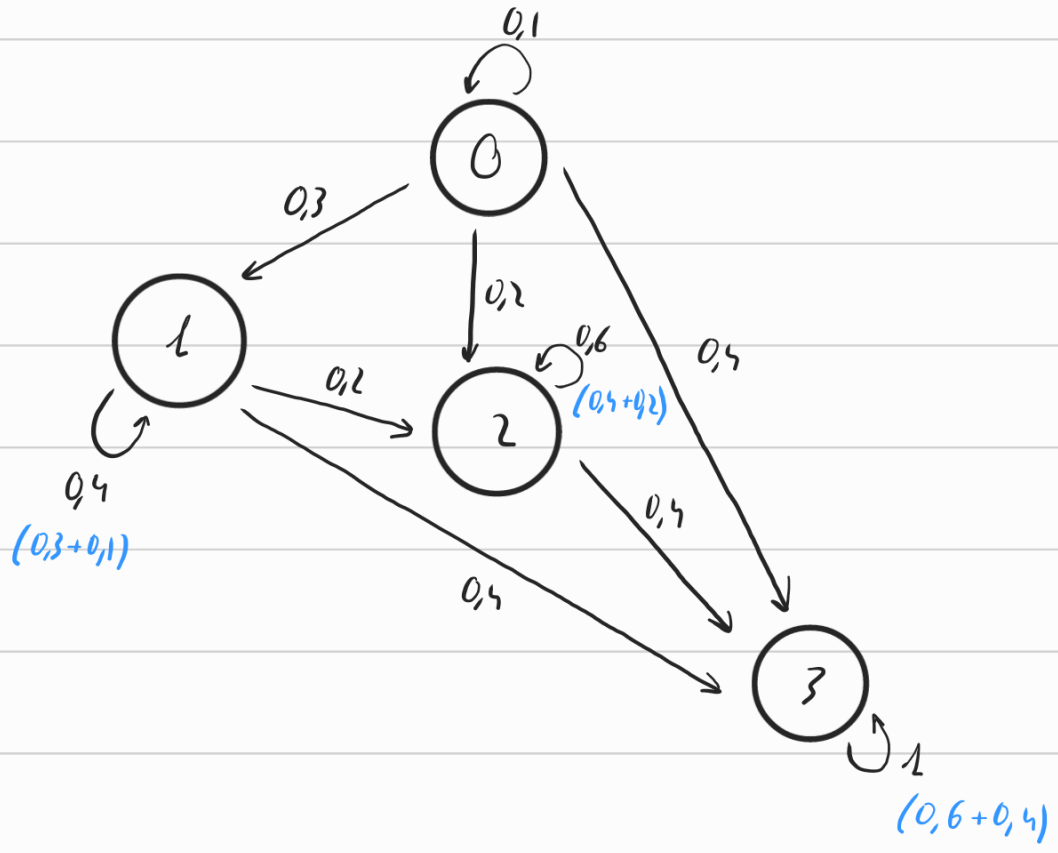

$$P_{ij} = \begin{array}{c} \\ 0 \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{cccc} 0 & 1 & 2 & 3 \end{array} \\ \begin{pmatrix} 0,1 & 0,3 & 0,2 & 0,4 \\ 0 & 0,4 & 0,2 & 0,4 \\ 0 & 0 & 0,6 & 0,4 \\ 0 & 0 & 0 & 1 \end{pmatrix} \end{array}$$

$\begin{cases} i \rightarrow \text{row} \\ j \rightarrow \text{column} \end{cases}$

$$P(X_{n+1} = j \mid X_n = i)$$

It is a Markov chain, as X_n just depends on X_{n-1}.