

HW3Q3 $f_x(x) = \begin{cases} e^{-x} & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$

$$f_y(y) = 0.5 e^{-|y|}$$

Q: $\int_{y=-\infty}^{\infty} \int_{x=-\infty}^{\infty} e^{-s(x+y)} f_x(x) f_y(y) dx dy$

Ans: $\int_{y=-\infty}^{\infty} \left(\int_{x=-\infty}^{\infty} e^{-sx} f_x(x) dx \right) e^{-sy} f_y(y) dy$

$$= \left(\int_{x=-\infty}^{\infty} e^{-sx} f_x(x) dx \right) \left(\int_{y=-\infty}^{\infty} e^{-sy} f_y(y) dy \right)$$

→ term 1

→ term 2

term 1: $\int_0^{\infty} e^{-(1+s)x} dx$

$$= \frac{1}{1+s}$$

term 2: $\int_{y=-\infty}^0 0.5 e^{(1-s)y} dy + \int_0^{\infty} 0.5 e^{(-1-s)y} dy$

$$= \frac{0.5}{1-s} + \frac{0.5}{1+s} = \frac{1}{1-s^2}$$

Ans: $\frac{1}{1+s} \times \frac{1}{1-s^2}$ let $s=0$. ~~1~~

HW3 Q7 Problem 2.69

Note Title

1/28/2011

A number x is selected at random in $[-1, 2]$ Let the event $A = \{x < 0\}$

$$B = \{|x - 0.5| < 0.5\} \quad C = \{x > 0.75\}$$

Find $P(A|B)$ $P(B|C)$ $P(A|C^c)$ $P(B|C^c)$

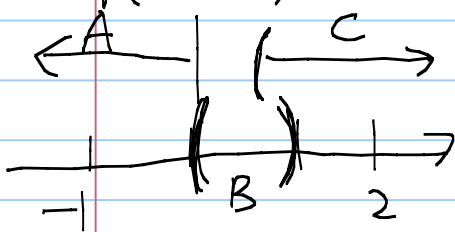
Ans: $S = [-1, 2]$ is continuous,
 \Rightarrow we use pdf.

$$f_x(x) = \begin{cases} c & \text{if } -1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

$$\therefore \int_{-\infty}^{\infty} f_x(x) dx = 1 = \int_{-1}^2 c dx \Rightarrow c = \frac{1}{3}$$

$$\therefore f_x(x) = \begin{cases} \frac{1}{3} & \text{if } -1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

$$P(A|B) = 0 = \frac{P(A \cap B)}{P(B)} = \frac{0}{\int_0^1 \frac{1}{3} dx}$$



$B: x$ is from
 $0 < x < 1$

$$A \cap B = \emptyset$$

$$P(B|C) = \frac{0,25}{1,25} = \frac{1}{5}$$

$$= \frac{P(B \cap C)}{P(C)} = \frac{0,25 \times \frac{1}{3}}{1,25 \times \frac{1}{3}}$$

$$C: x > 0,75 \quad P(C) = \int_{0,75}^2 \frac{1}{3} dx$$
$$= 1,25 \times \frac{1}{3}$$

$$B \cap C: 0,75 < x < 1 \quad P(B \cap C) = \int_{0,75}^1 \frac{1}{3} dx$$
$$= 0,25 \times \frac{1}{3}$$

$$P(A|C^c) = \frac{1}{1,75} = \frac{P(A \cap C^c)}{P(C^c)} = \frac{1 \times \frac{1}{3}}{1,75 \times \frac{1}{3}}$$

$$C^c = x \leq 0,75 \quad P(C^c) = \int_{-1}^{0,75} \frac{1}{3} dx$$

$$A \cap C^c = x < 0 \quad P(A \cap C^c) = \int_{-1}^0 \frac{1}{3} dx$$

$$P(B|C^c) = \frac{0,75}{1,75} = \frac{P(B \cap C^c)}{P(C^c)} = \frac{0,75 \times \frac{1}{3}}{1,75 \times \frac{1}{3}}$$

$$B \cap C^c = 0 < x < 0,75 \quad P(B \cap C^c)$$
$$= \int_0^{0,75} \frac{1}{3} dx$$
$$= \frac{1}{3} \times 0,75$$

HW3 Q/3 A traveling salesperson problem

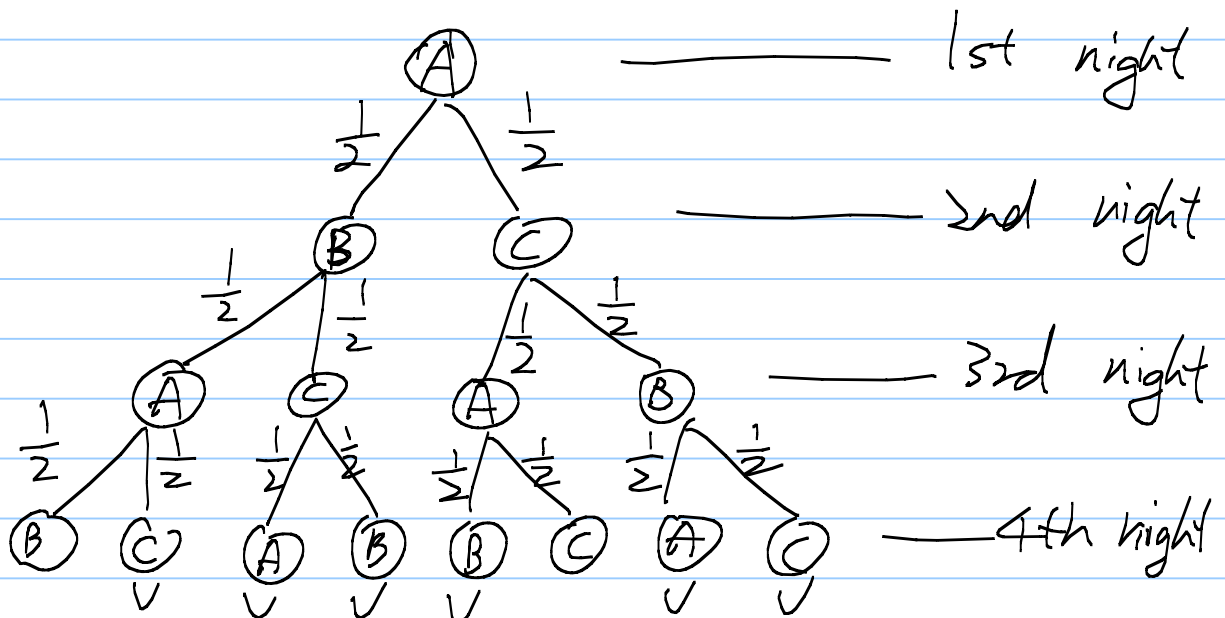
3 cities A, B, C,

4 nights, first night in A.

the next night he/she moves randomly to one of the other two cities.

Q: $P(\text{all three cities are visited})$?

Ans: Tree method



Q: Prob that all cities have been visited
 $= P(ABAC, ABCA, ABCB, ACAB, ACBA, ACBC) = \frac{6}{8}$