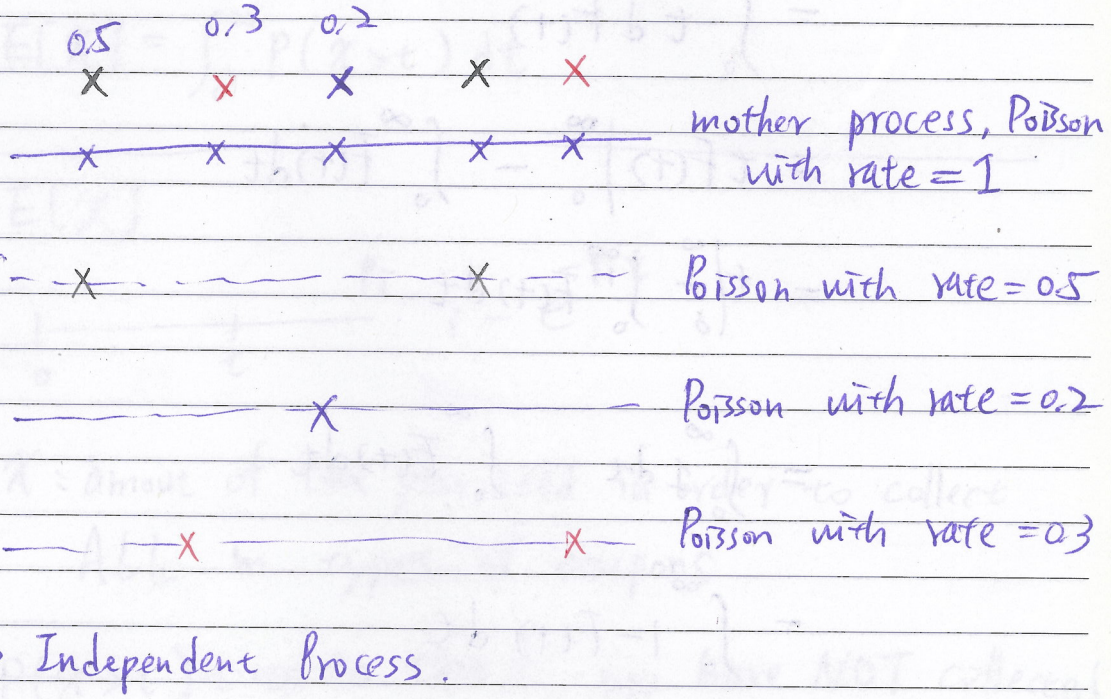
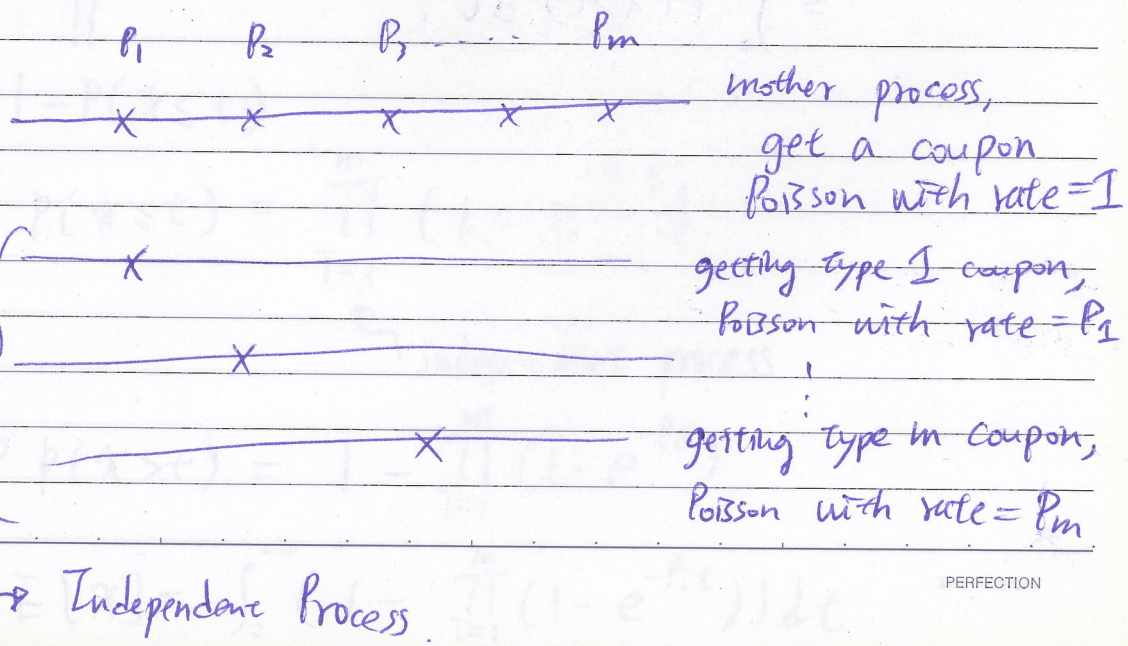
11/28 (Wed)

Poisson Process (Branching processes of Poisson process are also Poisson processes)



Coupon Collector Problem

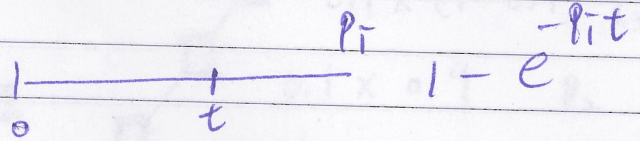


Survivor Representation of Expectation

Let X be a nonnegative RV

$$E[X] = \int_0^\infty P(X>t)\,dt$$

$E[X]$



X = amount of time you need in order to collect ALL m types of coupons.

$P(X>t)$ = up to time t, you have NOT collected ALL m types of coupons.

$\|$

$1-P(X\le t)$

$$P(X\le t) = \prod_{i=1}^{m}(1-e^{-p_i t})$$

↳ independent process

$$\Rightarrow P(X>t) = 1-\prod_{i=1}^{m}(1-e^{-p_i t})$$

$$\Rightarrow E[X] = \int_0^\infty \left(1-\prod_{i=1}^{m}(1-e^{-p_i t})\right)dt$$

PERFECTION