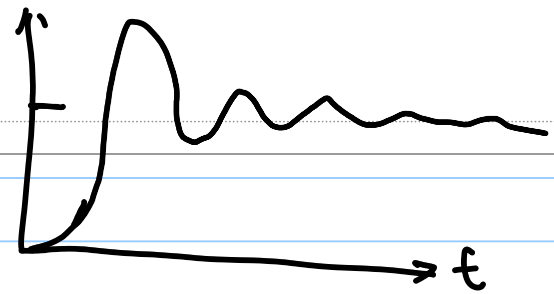
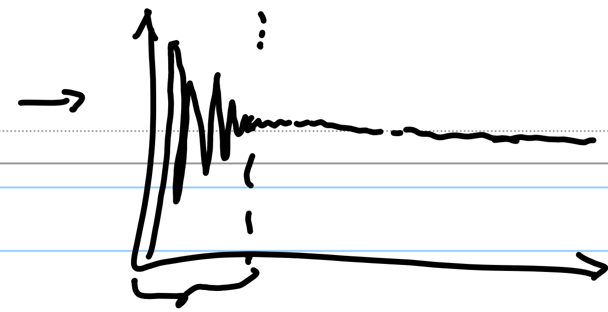
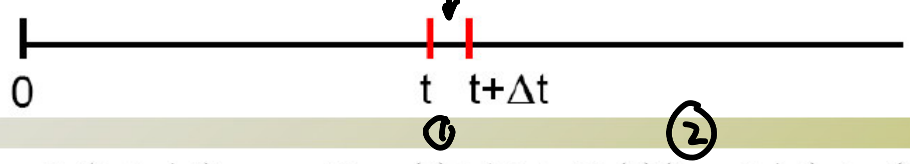
Note Title 9/26/2013





$I(t) = N - S(t) - R(t) - Q(t)$



$$\begin{aligned}
P_n(t+\Delta t) &= P_{n-1}(t)\lambda\Delta t + P_n(t)(1-\lambda\Delta t) + o(\Delta t) \\
P_n(t+\Delta t) - P_n(t) &= P_{n-1}(t)\lambda\Delta t - P_n(t)\lambda\Delta t + o(\Delta t) \\
\frac{P_n(t+\Delta t) - P_n(t)}{\Delta t} &= P_{n-1}(t)\lambda - P_n(t)\lambda + \frac{o(\Delta t)}{\Delta t}
\end{aligned}$$

1. n-1 arrived by t, 1 arrived during [t, t+Δt]
2. n arrived by t, 0 arrived during [t, t+Δt]

, $P_0(t+\Delta t) = P_0(t)(1-\lambda\Delta t)+o(\Delta t)$ $\longrightarrow$ $\underbrace{\dfrac{P_0(t+\Delta t) - P_0(t)}{\Delta t}} = -\lambda P_0(t) + \dfrac{o(\Delta t)}{\Delta t}$

$dP_0(t)/dt = -\lambda P_0(t)$

$P_0(t) = e^{-\lambda t}$ Why?

$$\Downarrow$$

$$\frac{dP_0(t)}{dt} = -\lambda P_0(t)$$

$$\left.\begin{array}{l} P_0(0) = 1 \\ P_0(t) = c e^{-\lambda t} \end{array}\right\} \Rightarrow c = 1$$

$E[X] = \frac{1}{\lambda} = \frac{10}{24}$ days

$\Rightarrow \lambda = 2.4$

$P(X<1)$?

$P(X<t) = 1 - e^{-\lambda t}$

$P(X<1) = 1 - e^{-2.4} = 0.909$

$$P_n(t) = e^{-\lambda t}\frac{(\lambda t)^n}{n!}$$

Q_2: $P(N(1)=5)$?

$\Rightarrow P_5(1) = e^{-2.4}\dfrac{(2.4)^5}{5!}$

Q_4: $P(N(1)=0)$