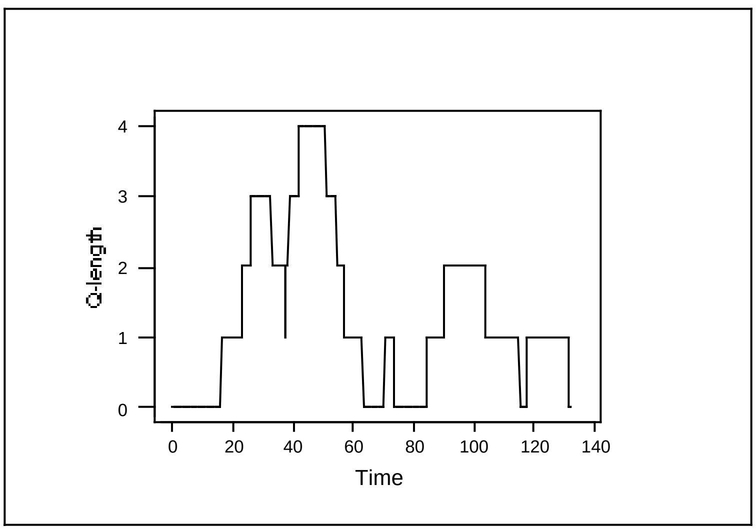
STAT 280 November 26, 2001

Projects are still being marked. Return by Friday.

Today: Review of Ch 7 (7.5 on)-Ch 8
And Course Evaluations

7.5 M/M/1 Queuing Process

Can consider as composed of two parts:
I - Event times (of arrivals and service completions)
II – Transitions of queue length state



II is sometimes called the Imbedded Markov Chain

Note that transitions in the Imbedded Markov Chain can only be +1 or –1; that is i->i+1 or i-> i-1.

Conversely, a change in the queue length indicates whether it is an arrival or a service completion.
Steady State distributions for an M/M/1 queue can be found from simulations, or using the formula p 295.
$r=\lambda_A/\lambda_S$ is called the arrival/service ratio.
$\pi_i = (1-\lambda_A/\lambda_S)(\lambda_A/\lambda_S)^i$ for i = 0,1,2, ….

7.6-7.8 M/M/k

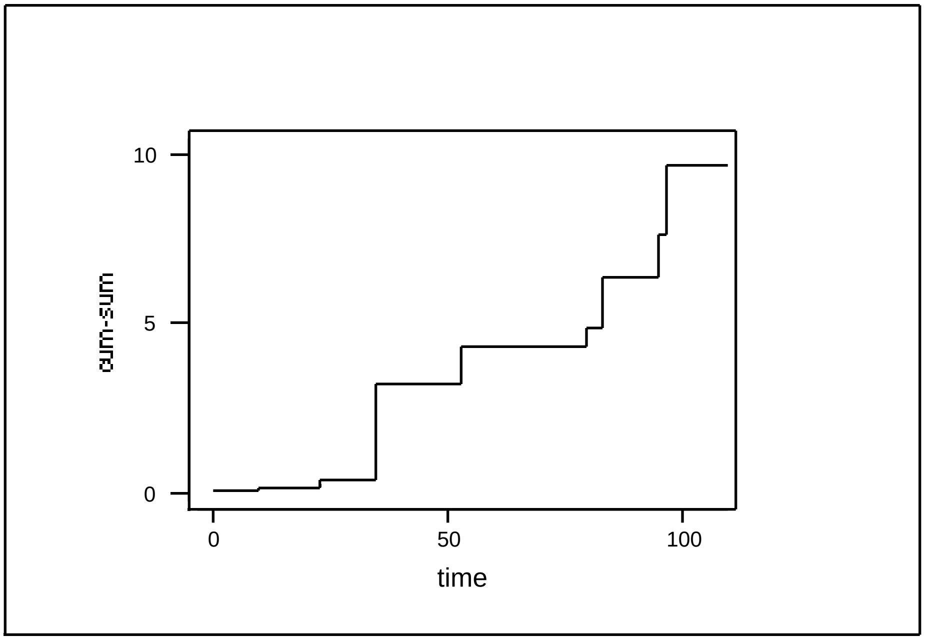
Balance equations:
The rate of arrivals to state j
= rate of service completions from state j+1
$\pi_j a_j = \pi_{j+1} s_{j+1}$
This leads to steady state distribution of queue length (See page 308) but requires
$1+a_0/s_1+ a_0a_1/s_1s_2 + a_0a_1a_2/s_1s_2s_3 + \ldots$ .must be finite. (*)
Note need for π_0 computed from sum of k terms

Consider what happens when k-> ∞. Infinite server queue.
Queue length would then be Poisson. Why? See Sec 7.8.

Ch 8: Sums of Independent Random Variables
8.1 – 8.3: CLT and basics about mean and variance.
8.4: Random Sums of RVs: Main result Thm 8.4-1

about Compound Poisson Process. Events with exponential interarrivals but count may be any RV, not just +1. Compound Poisson Process is cumulative “counts” {N(t); t>0}. “Counts” really just sum – not integer.

*********Time for Course Evaluations**********



Calculation Depends of Thm 2.9-1 and 2.9-2. Review later.