

IEOR 8100: Topics in OR: Asymptotic Methods in Queueing Theory

Fall 2009, Professor Whitt

Class Lecture Notes: Wednesday, September 23.

more on D and useful functions

Topics Covered

1. The BIG PICTURE: Many limits can be viewed as a consequence of the CLT. Sums of random variables are approximately normally distributed, and the entire process $\{S_n : n \geq 0\}$ when put in the framework $\{[S_{[nt]} - mnt]/\sigma\sqrt{n} : t \geq 1\}$ is approximately distributed as Brownian motion for appropriate constants m and σ , provided that the individual random variables being added are at most weakly dependent, and all of the random variables are suitably small compared to the sum (just a few variables do not dominate) and the first two moments are finite. (The IID case with finite mean and variance is an important case, but a very special case.) Moreover, many other limits can be viewed as a consequence, e.g., by applying the continuous mapping theorem.

2. the space D ; the J_1 and M_1 metrics; §3.3 of [W]

3. addition in $D \times D$; Example 3.3.1 on p. 84 and Thm 12.7.3 on p. 411 of [W]

4. composition plus centering, or composition plus addition; §13.3 of [W]

5. CLT for renewal reward processes; an application of composition plus centering; §§7.4 and 13.3 of [W]. An application is a FCLT for the virtual waiting time in the $GI/GI/1$ queue. See (2.4) and (2.5) on p. 290 and then §9.3.3 of [W]