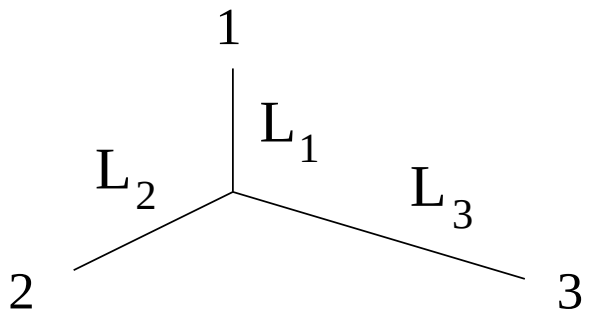
Assignment #7 PY 542 Weeks of 10/27–31 & 11/3–7, 2008

Notes: The midterm will be given on Thursday November 13 during the regular class session. No notes or books allowed. Memorization-type formulae will be provided. Past midterm(s) will be posted on the course website.

Problems: Due Thursday November 6 in class.

1. Consider a particle that is initially located at the junction of three line segments of lengths L_1, L_2, and L_3, with $L_1 < L_2 < L_3$ (see figure below). The particle freely diffuses in each segment, but when the end of a segment is reached the particle is absorbed.
   (a) What is the probability that the particle is eventually absorbed at the end of the i^{th} segment?
   (b) What is the average time for the particle to be absorbed at one of the endpoints? (That is, the identity of the absorbing segment is unspecified when absorption occurs.)
   (c) What is the average time for the particle to be absorbed at the end of the i^{th} segment? (That is, the identity of the absorbing segment *is* specified when absorption occurs.)



2. Use the scaling approach to determine the mass distribution for constant-kernel aggregation; that is, determine the scaling function $f(u)$ for the scaled master equation
$$2f(u) + uf'(u) + \Lambda^{-1}\mathcal{K}(u) = 0$$
where
$$\mathcal{K}(u) = \frac{1}{2}\int_0^u dv\, K(v, u-v)\, f(v)\, f(u-v) - \int_0^\infty dv\, K(u,v)\, f(u)\, f(v)\,.$$

3. Investigate the product kernel aggregation with input.
   (a) Show that in the pre-gel regime, the second moment is $M_2 = \tan t$. Thus gelation occurs at $t_g = \pi/2$.
   (b) Show that $N = t - t^3/6$ in the pre-gel regime.