Assignment 1, Due at 11:35 on Tuesday February 5th

1) Show that for any branching process, if ν is the extinction probability, G is the probability generating function for the number of children, and s is the expected size of the tree given it is finite then $s = (1 - G'(\nu))^{-1}$.

2) Consider a stochastic process which generates a sequence of random variables $X_1, X_2, \ldots$ and associated partials sums $S_n = \sum_{i=1}^{n} X_i$ where X_1 is 1 with prrobbability 1/2 and -1 with probability 1/2 and for $j = 2, 3, ..$ in turn we set $X_j = X_{j-1}$ with probability 2/3 and set $X_j = -X_{j-1}$ with probability 1/3 where these choices are made independently.

(a) Show that the probability we return to 0 is 1.

(b) Show that the expected number of returns to 0 is infinite.

3. Question 6 on page 207 of the text.

4. Question 7 on page 207, except I only want you to determine the probability exactly when $p = 1/3$ and then estimate p_1 to four decimal places when $p = 1/2$.