## Quiz 1 4/13/07 Physics 219

A one dimensional random walk is composed of two kinds of steps. The even steps are taken with a probability density of

$$w_1(s) = (\delta(s-l) + \delta(s+l))/2$$

where s is the displacement and l is a constant. The odd steps are taken with a probability density

$$w_2(s) = \frac{e^{-\frac{s^2}{2\sigma^2}}}{\sqrt{2\pi\sigma^2}}$$

where  $\sigma^2$  is the variance of this distribution. All steps are all independent of each other.

- **a** (5 points) Find the exact expression for the probability density  $\mathcal{P}(x)$  for the total displacement x after 2N steps. Your answer should be in the form of a summation.
- **b** (5 points) Find the exact variance and the mean of the total displacement.