$$
\begin{gathered}
\text { Quiz } 1 \\
4 / 13 / 07 \\
\text { Physics } 219
\end{gathered}
$$

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 $2 N$ 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.

