1 Random Projections Handout

Assume that the d dimensional vector $\mathbf{u}$ is obtained by setting each of its coordinates to either $+1$ or -1 based on coin flips. That is, for each $i \in [d]$, $\mathbf{u}[i] = \begin{cases} +1 & \text{with probability } 1/2 \\ -1 & \text{with probability } 1/2 \end{cases}$.
Now set $y_t = \mathbf{x}_t^\top \mathbf{u}$ for every $t \in [n]$.

Question: For some $t, s \in [n]$, what is:

1. $\mathbb{E}[y_t - y_s]$?
2. $\mathbb{E}[(y_t - y_s)^2]$?