ORF527 - Problem Set 2

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Q.1

$(W_{t_1}, \dots W_{t_n})$ and $(W'_{t_1}, \dots W'_{t_n})$ are both guassian with the same mean and covariance matrix, so they do have the same carateristic function and therefore the same distribution. So

$$\mathbb{E}f(W_{t_1}, \dots W_{t_n}) = \mathbb{E}f(W'_{t_1}, \dots W'_{t_n})$$

Q.2

Since B is closed, $W_t \notin B \iff \exists \varepsilon > 0 \, \forall y \in B(y, \varepsilon) W_y \notin B$ $\{\tau \leq t\} =$

Q.3

Without loss of generality we can assume $t \in J$. $(W_i)_{i \in J}$ is a discrete markov chain. Let $A \in \mathcal{F}_\tau$, so that $A \cap \{\tau \leq t\} \in \mathcal{F}_t$.

$E[1_A f(W_{t+\tau})] = E[1_A \int f(x) \frac{e^{-(x-w_\tau)^2/2t}}{\sqrt{2\pi t}} dx]$