1. Для процесса $Y_t = W_t^3 \cos W_t + tW_t$ найдите dY_t и выпишите ответ в полной форме записи.
2. Для процесса $Y_t = f(t)\exp(t + W_t)$ найдите dY_t и подберите функцию $f(t)$ так, чтобы процесс Y_t был мартингалом.
3. Найдите $\mathrm{E}(\int_0^t W_s \cos s dW_s)$ и $\mathrm{Var}(\int_0^t W_s \cos s dW_s)$
4. Для броуновского движения W_t определим величину Y равную единице, если $W_2 > 0$, и нулю иначе. Найдите $\mathrm{Cov}(Y, W_3)$, $\mathrm{Cov}(Y, W_1)$.
5. The process X_t is given by
$$X_t = 2017 + t^2 W_t^2 + \int_0^t u\, dW_u$$
   (a) Find dX_t;
   (b) Is X_t a martingale?
   (c) Find $\mathrm{E}(X_t)$.
6. The process Y_t is given by $Y_t = 2W_t + 5t$. The stopping time τ is given by $\tau = \min\{t | Y_t^2 = 100\}$. Find the distribution of the random variable Y_τ and the expected value $\mathrm{E}(\tau)$.

   Hint: you may find the martingales a^{Y_t} and $Y_t - f(t)$ useful
7. Consider the framework of the Black and Scholes model. You agreed with Warren Buffett that at fixed time T he will pay you the strange sum
$$X_T = \ln S_T \cdot \ln S_{T/2},$$
   where S_t is the price of a share.

   What is the non-arbitrage price X_0 of this agreement?