Homework set #5

1. Assume that X is $N(0, 1)$, B satisfies $P(B = 1) = P(B = -1) = 1/2$, and B is independent of X. Define $Y = B\,|X|$.

   (a) Find the distribution of Y.

   (b) Find $\mathrm{Cov}(X, Y)$.

   (c) Are X and Y independent? Explain.

2. Let $Y \sim \chi^2(p, \lambda)$.

   (a) Show that if $Y \sim \chi^2(p, \lambda)$ then $EY = p + \lambda$, $\mathrm{Var}(Y) = 2(p + 2\lambda)$.

   (b) Find the moment generating function of Y.

3. Show that if $Y_1 \sim \chi^2(p_1, \lambda_1)$ and $Y_2 \sim \chi^2(p_2, \lambda_2)$ are independent, then $Y_1 + Y_2 \sim \chi^2(p_1 + p_2, \lambda_1 + \lambda_2)$.

4. From book 7.4, 7.5, 9.2.