Statistics 630 - Assignment 5
(due Wednesday, 13 October 2021)

View lectures 13–16. Note: this assignment involves a fair amount of calculus and algebra, so please give yourself plenty of time.

1. Chapter 2 Exercise 2.9.7.
2. Chapter 2 Exercise 2.9.14. You may assume $\mu_1 = \mu_2 = 0$ and $\sigma_1 = \sigma_2 = 1$. Hint: re-express the integral as [a function of z] $\times$ [the total integral of a normal pdf]. The pdf you integrate is a function of the other variable, but it also will depend on z; and based on the hint it should be apparent what the first factor must be. It may help to do the algebra separate from the integration and then substitute as you do the integral.
3. Chapter 3 Exercise 3.1.2(a–f). Compute (a) and (d) using *both* the joint pmf and the marginal pmf for X.
4. Chapter 3 Exercises 3.1.5, 3.1.6, 3.1.11.
5. Chapter 3 Exercise 3.1.23. (This is nearly immediate – see Example 2.8.5 in the book for the marginal distributions.)
6. Chapter 3 Exercise 3.2.2(a–f). Compute (a) and (d) using *both* the joint pdf and the marginal pdf for X.
7. Chapter 3 Exercise 3.2.6.
8. Chapter 3 Exercises 3.2.19, 3.2.22. For 3.2.22, use property (2.4.7) in the book.
9. Chapter 3 Exercises 3.3.2(b–d) (use your solutions to Exer. 3.1.2) and 3.3.3 (use your solutions to Exer. 3.2.2).
10. Chapter 3 Exercises 3.2.8, 3.3.20. Also find $\mathsf{Var}(Y+Z)$, assuming Y and Z are independent. You may assume that if $X \sim \text{gamma}(\alpha, \lambda)$ then $\mathsf{E}(X) = \frac{\Gamma(\alpha+1)}{\lambda\Gamma(\alpha)} = \frac{\alpha}{\lambda}$ and $\mathsf{E}(X^2) = \frac{\Gamma(\alpha+2)}{\lambda^2\Gamma(\alpha)} = \frac{\alpha(\alpha+1)}{\lambda^2}$. (See Exercises 2.4.15 and 3.2.16.)
11. Chapter 3 Exercise 3.3.6.
12. Let X, Y, and Z be uncorrelated random variables with variances σ_X^2, σ_Y^2, and σ_Z^2, respectively. Let $U = X + Z$ and $V = Y + Z$. Find $\mathsf{Cov}(U, V)$ and $\mathsf{Corr}(U, V)$.