Module 15 self-assessment

Question 1

Let X_1 and X_2 be independent standard normal random variables, and define $Y_1 = 2X_1 + X_2$ and $Y_2 = X_1 - X_2$. Find

1. the expectations of Y_1 and Y_2,
2. the covariance between Y_1 and Y_2, and
3. the joint $p_{Y_1,Y_2}(y_1, y_2)$

Question 2

Let X and Y be continuous random variables with joint density $p_{X,Y}(x, y) = x + y$ defined on the square $[0, 1] \times [0, 1]$. Compute $F_{X,Y}(x, y)$ their respective CDF, and the marginal densities of X and Y. Are X and Y independent? What is the covariance $\mathrm{Cov}(X, Y)$?