1: Suppose \( x_1, x_2, \) and \( x_3 \) are multivariate normally distributed with means \( \mu_1 = 1, \mu_2 = 0, \mu_3 = -2, \) and covariance structure
\[
\sigma^2(x_1) = 3, \quad \sigma^2(x_2) = 4, \quad \sigma^2(x_3) = 6, \quad \sigma(x_1, x_2) = 1, \quad \sigma(x_1, x_3) = -1, \quad \sigma(x_2, x_3) = 2
\]

Finally, define \( y = x_1 - 3x_2 + 4x_3 \) and \( z = 3x_1 + 4x_2 - 7x_3. \)
(a) Compute \( \sigma^2(y). \)
(b) Compute \( \sigma^2(z). \)
(c) Compute \( \sigma^2(y, z), \rho(y, z) \)
(d) What is the distribution of \( x_1, x_2 \) given \( x_3? \)
(e) What is the regression of \( x_1 \) on \( x_2 \) and \( x_3? \)
(f) What is the conditional variance of \( x_1 \) given \( x_2 \) and \( x_3? \)