Work the following problems from Christensen (C)

1. 1.11; hint $\mathsf{Cov}(A\mathbf{Y}, B\mathbf{Y}) = A\mathsf{Cov}(\mathbf{Y})B^T$
2. 1.4 (see sketch from class notes & book)
3. 1.5.3
4. (optional) Suppose $\mathbf{\Sigma}$ is a real $p \times p$ positive semi-definite matrix. Then the Cholesky decomposition of $\mathbf{\Sigma} = \mathbf{L}\mathbf{L}^T$ where $\mathbf{L}$ is a lower triangular matrix with real, non-negative elements on the diagonal.

   If you can generate standard normal random variates, $\mathbf{Z} = (z_1, \ldots, z_p)^T$ with $z_i \overset{\text{iid}}{\sim} N(0, 1)$, then what is the distribution of $\mathbf{Y} = \mu + \mathbf{L}\mathbf{Z}$ for $\mu \in \mathbb{R}^p$? Explain why it does not matter for generating $\mathbf{Y}$ that the Cholesky decomposition is not unique when $\mathbf{\Sigma}$ is not positive definite.