1. Required Problems: 2.1.2, 2.1.3, 2.1.11, 2.2.10, 2.2.14, 2.2.17, 2.2.23

2. (Required) (Zero-inflated Poisson model) Consider a marginal pmf

\[ f(x|\lambda) = pI[x = 0] + (1 - p) \frac{\exp(-\lambda) \lambda^x}{x!} \] for \( x = 0, 1, 2, \ldots \)

(this is a Poisson distribution with some "extra mass" at 0 or alternatively, a mixture of a Poisson distribution and a point mass at 0). Suppose parameters are \( p \in [0, 1] \) and \( \lambda \geq 0 \). Find \( E_{p,\lambda}X \) and \( E_{p,\lambda}X^2 \). Then, for \( X_1, X_2, \ldots, X_n \) iid with this marginal distribution, find a method of moments estimator for the parameter vector \( (p, \lambda) \) based on the first two sample moments.

3. Optional (not required, but recommended): Problems 2.1.14, 2.2.15, 2.2.16, 2.2.19, 2.2.21