9.6 Likelihood Ratio Tests for Multinomial Distributions

Example: Berkson (1966). Fitting Poison probabilities with unknown parameter λ, for cell counts in a table (see Section 8.2).

Pearson's chi-square statistic:

$$X^2 = \sum_{\text{all cells}} \frac{(O_i - E_i)^2}{E_i}$$

Under the null hypothesis, X^2 is approximately the chi-square distribution with the number of degrees of freedom (df) given by

df = number of cells - number of independent parameters fitted - 1

(a) Find Pearson chi-square statistic for this example.
(b) Find the likelihood ratio.
(c) Use a Taylor series to show that these two are asymptotically equivalent.