1. (`C` code) Implement Newton-Raphson to find the exinction probability of the male surname branching process model we solved by fixed point iteration. Write an R wrapper to call the code from R using `.Call()`. Your R wrapper should take an initial value and a relative convergence criterion.

2. Consider the dataset on Canvas that reports the number of oil spills Y_i for each i of several years along with the amount of oil shipped internationally x_{i1} and domestically x_{i2} in each of those years. Assume Poisson model

$$Y_i \mid x_{i1}, x_{i2} \sim \text{Poisson}(\beta_1 x_{i1} + \beta_2 x_{i2}).$$

   (a) Derive Newton's update equation.

   (b) Derive the Fisher scoring update equation.

   (c) (`C` code) Implement Newton's method and the Fisher scoring method. Where appropriate use simple backtracking. Estimate the MLEs for β_1 and β_2. When available, report the variance of the MLEs. Your code should run by taking 'n' or 'f' to indicate Newton's or Fisher scoring, initial values for β_1 and β_2 and a relative convergence criterion on the Euclidean norm of (β_1, β_2) on the command line (in that order, no command line flags). It can print out any amount of information, but the last line should be the estimates with 6 digits of precision and the number of iterations, separated by spaces. No need to call this code from R.