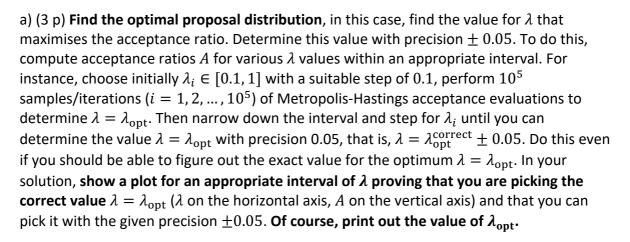
Assignment 6

1. Implement the **Metropolis-Hastings** (M-H) algorithm to simulate gamma distribution $Ga(\alpha,\beta)$, using exponential distribution $Exp(\lambda)$ as the proposal distribution. Simulate Ga(3,1). **Use the independence chains version of M-H**. (Out of peergrave: α in gamma distribution and α denoting the acceptance probability are two different things; standard

notation: sorry to disappoint you but no reason for my head to roll for this ...)



- b) (2 p) Use the optimal proposal distribution to simulate Ga(3,1). Simulate for 10^6 samples. Plot the resulting distribution (10^6 points in a histogram, use a sufficient number of bins) with the corresponding functional form of the gamma distribution (line plot for this- not a histogram; for example plt.plot(np.arange...) Gamma(np.arange...)).
- c) (1 p) **Compute and print the numerical values for mean and variance** for the resulting distribution.
- d) (1 p) Which of the two methods, the Gibbs sampler or Metropolis-Hastings, requires less information and so is more generally applicable? State briefly the reason for this (one sentence will suffice).

Note: The definitions used here for $Ga(\alpha,\beta)$ and $Exp(\lambda)$ are the ones given in the lecture notes. If you use some other definition, make sure you calculate the corresponding values in that parametrisation. (In order to have the same numbers to check for in peergrade.) **Note also:** Distibutions here are densities – not CDFs. This is how the word is typically used, although the "official" definition means cumulative functions, see Lecture 1.