

**CS&S/STAT 563 — Statistical Demography & Data Science — Spring 2020 -  
Homework no. 1**

Due Monday April 6 at 2:00pm on the course Canvas website.

**Note:** Please write your homework as a report, including figures and tables with captions. Please do not write your homework as annotated computer output. However, please do include an appendix containing the computer code that you used (if you used any — maybe no need for this homework.)

1. Suppose the force of mortality at age  $x$  for a cohort is  $\mu(x) = 0.005 + 0.0005(x - 15)^2$ . Denote by  $X$  the age at death of a person randomly chosen from this cohort (a random variable). Find analytically and plot the cumulative hazard function of this distribution,  $\Lambda(x)$ .
2. Find analytically and plot the survival function,  $S(x)$ .
3. Find and graph the probability density function of  $X$ ,  $f(x)$ .
4. Create and show a life table for single years of age for this cohort for ages 0–50, containing the quantities  ${}_1m_x$ ,  ${}_1q_x$ ,  $\ell_x$  and  ${}_1d_x$ .
5. Find the life expectancy at birth of a member of this cohort.
6. Find the life expectancy at age 10 of a member of this cohort.
7. Find  ${}_{15}q_{15}$  for this cohort.