

Michigan State University
STT 455 - Actuarial Models I
Fall 2013 semester
Homework No. 1
due Friday, 5:00 pm, September 20, 2013

Please follow the instructions below:

Return this page with your signature.

Submit your work to our graduate assistant, Ed Cruz, at C505 Wells.

Write your name and section number at the spaces provided:

Name: _____ **Section:** _____

I certify that this is my own work, and that I have not copied the work of another student.

Signature: _____ **Date:** _____

1. (30 points) Let T_0 be the lifetime of a newborn random variable with density function defined by

$$f_0(x) = \frac{1}{100}e^{-x/50} + \frac{1}{200}e^{-x/100}, \quad \text{for } x \geq 0.$$

Find expressions for the following:

- (a) [7 points] $S_0(x)$
- (b) [7 points] μ_x
- (c) [7 points] ${}_t p_x$
- (d) [9 points] Calculate ${}_{25|5} q_{40}$ and interpret this probability.

2. (30 points) You are given:

$${}_{10}p_x = 0.90$$

$${}_{15}p_x = 0.85$$

$${}_5p_{x+5} = 0.95$$

Calculate the following:

(a) [10 points] ${}_5q_x$

(b) [10 points] ${}_{10|5}q_x$

(c) [10 points] ${}_{10}p_{x+5}$

3. (40 points) You are given the force of mortality:

$$\mu_x = \begin{cases} 0.02, & 0 < x < 50 \\ 0.04, & x \geq 50 \end{cases}$$

Calculate the following:

- (a) [10 points] the probability that (30) will live another 15 years;
- (b) [10 points] the probability that (65) will die before reaching age 75;
- (c) [10 points] the probability that (40) will die between ages 45 and 55; and
- (d) [10 points] the average lifetime of (40).