MATH 3630 - Actuarial Mathematics I
Fall 2011 - Valdez
Homework No. 3
due Wednesday, 5:00 PM, 19 October 2011

**Please return this page with your signature. Please write your name and student number at the spaces provided:**

**Name:** SUGGESTED SOLUTIONS **Student ID:** _____

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

**Signature:** _____ **Date:** _____

You are given that for a whole life insurance issued to $(x)$ that pays \$100 at the moment of death:

- The actuarial present value of the policy is \$60.00 based on a constant force of mortality $\mu$ and a constant force of interest equal to 0.02. $\Rightarrow 100\left(\frac{\mu}{\mu+.02}\right)=60$
- The actuarial present value of the policy is \$63.64 based on a constant force of mortality $\mu+c$ and a constant force of interest equal to 0.02. $\Rightarrow 100\left(\frac{\mu+c}{\mu+c+.02}\right)=63.64$

1. Determine the values of $\mu$ and $c$.
2. Calculate the actuarial present value of the policy based on a constant force of mortality $\mu$ and a constant force of interest $0.02+c$, where $\mu$ and $c$ are the constants determined in 1.
3. Calculate the actuarial present value of the policy based on the force of mortality

$$\mu_{x+t}=\begin{cases}\mu, & \text{for } 0<t\leq 15\\ \mu+c, & \text{for } t>15\end{cases}$$

and the force of interest

$$\delta_t=\begin{cases}0.02+c, & 0<t\leq 15\\ 0.02, & \text{for } t>15\end{cases},$$

where $\mu$ and $c$ are the constants determined in 1.

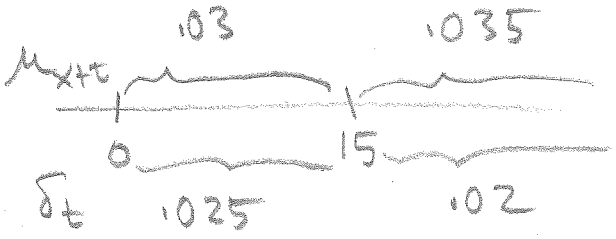
(1) $\frac{\mu}{\mu+.02}=\frac{60}{100}=.6 \Rightarrow \mu=.6\mu+.012 \Rightarrow \mu=\frac{.012}{.4}=.03$

$\frac{\mu+c}{\mu+c+.02}=\frac{63.64}{100}=.6364 \Rightarrow \frac{.03+c}{.05+c}=.6364 \Rightarrow c=\frac{.6364(.05)-.03}{1-.6364}$

$=.005$

(2) $APV(policy) = 100\frac{\mu}{\mu+.02+C} = 100\ \frac{.03}{.03+.02+.005} = \underline{54.54}$

(3) $\mu = .03,\ \mu+C = .035,\ C = .005$




$$APV(policy) = 100\left[\frac{.03}{.055}\left(1-e^{-.055(15)}\right) + e^{-.055(15)}\cdot\frac{.035}{.055}\right]$$

$$= \underline{58.53}$$