MATH 3630 - Actuarial Mathematics I
Fall 2011 - Valdez
Homework No. 5
due Wednesday, 5:00 PM, 16 November 2011

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

Name: SUGGESTED SOLUTION **Student ID:** EMIL

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

Signature: _____ **Date:** _____

Martha is currently age 50 who purchases a deferred whole life annuity-due policy which will pay her the following benefits:

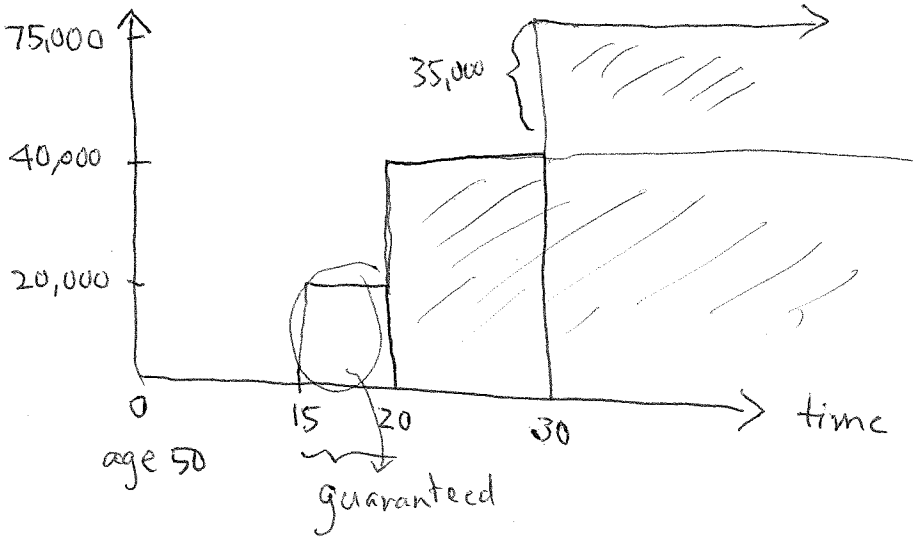
- guaranteed annual payments of \$20,000 for 5 years, starting when she reaches age 65;
- annual payments of \$40,000 for the subsequent 10 years, if alive; and
- annual payments of \$75,000, if alive, thereafter.

You are given:

- Mortality follows the `Standard Ultimate Survival Model`. [see attached]
- $i = 5\%$

Calculate the actuarial present value of Martha's life annuity benefits.

Draw the benefit pattern



HW5

$$APV(\text{annuity}) = {}_{15}E_{50}\left(20{,}000\,\ddot{a}_{\overline{5}|}\right) + {}_{20}E_{50}\left(40{,}000\,\ddot{a}_{70} + 35{,}000\,{}_{10}E_{70}\,\ddot{a}_{80}\right)$$

$$= 10{,}000\left[2\,{}_{15}E_{50}\,\ddot{a}_{\overline{5}|} + {}_{20}E_{50}\left(4\,\ddot{a}_{70} + 3.5\,{}_{10}E_{70}\,\ddot{a}_{80}\right)\right]$$

- ${}_{15}E_{50} = {}_{5}E_{50}\,{}_{10}E_{55} = 0.4615146$
- $\ddot{a}_{\overline{5}|} = \dfrac{1-v^5}{1-v} = \dfrac{1-(1.05)^{-5}}{1-(1.05)^{-1}} = 4.545951$
- ${}_{20}E_{50} = {}_{15}E_{50}\,{}_{5}E_{65} = 0.3482358$
- $\ddot{a}_{70} = 12.0083$
- ${}_{10}E_{70} = .50994$
- $\ddot{a}_{80} = 8.5484$

plug the values, to get

$$= 10{,}000\left[2(0.4615146)(4.545951) + 0.3482358\,(4(12.0083) + 3.5(.50994)(8.5484))\right]$$

$$262{,}360$$