

MATH 3631 - Actuarial Mathematics II
Spring 2011 - Valdez
Homework No. 2
due Monday, 6:15 PM, 28 February 2011

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

Name: EMIL Student ID: SUGGESTED SOLUTIONS

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

Signature: _____ Date: _____

For a fully-discrete whole life insurance of \$100 on (40), you are given:

- Mortality follows deMoivre's law with age limit ω .
- ${}_{14}V = 6.9376$, ${}_{15}V = 7.5234$, and ${}_{16}V = 8.1233$
- $i = 5\%$

Calculate ω .

Use the reserve recursive relationship

$$(kV + \pi)(1+i) - (b_{k+1} - {}_{k+1}V) q_{x+k} = {}_{k+1}V$$

where π is the level annual premium

For $k=14$, we have

$$(6.9376 + \pi)(1.05) - \underbrace{(100 - 7.5234)}_{92.4766} \frac{1}{w-54} = 7.5234$$

For $k=15$, we have

$$(7.5234 + \pi)(1.05) - \underbrace{(100 - 8.1233)}_{91.8767} \frac{1}{w-55} = 8.1233$$

Deducting the two equations, we get

$$\underbrace{(7.5234 - 6.9376)(1.05)}_{.61509} - \frac{91.8767}{w-55} + \frac{92.4766}{w-54} = 0.5999$$

Rearranging we get

$$\frac{92.4766}{w-54} - \frac{91.8767}{w-55} + .01519 = 0$$

This yields to the quadratic equation

$$92.4766(w-55) - 91.8767(w-54) + .01519(w-54)(w-55) = 0$$

OR simplifying we have

$$.01519 w^2 - 1.05581 w - 79.7567 = 0$$

$$w = \frac{1.05581 \pm \sqrt{(1.05581)^2 + 4(.01519)(79.7567)}}{2(.01519)}$$

$$w = 115 \text{ OR } w = \cancel{-46}$$

w cannot be negative

$$\text{Thus, } \underline{\underline{w = 115}}$$