

## MA (ST) 412 Supplement to 4.4 Solutions

1. By definitions, we have

$$\delta = \ln(1 + i) = 0.048790164, \quad \nu = \frac{1}{1 + i} = 0.9523809524.$$

Since deaths are uniformly distributed over each year of age, we have

$$\bar{A}_{36} = \frac{i}{\delta} A_{36}.$$

Therefore,

$$A_{36} = \frac{\delta}{i} \bar{A}_{36} = 0.180523607.$$

In addition, using the recursion formula

$$A_x = \nu q_x + \nu p_x A_{x+1},$$

we can get

$$A_{35} = \nu q_{35} + \nu(1 - q_{35})A_{36} = 0.179731781.$$

2. Since  $i = 0.03$ , we have

$$\delta = \ln(1 + i) = 0.029558802.$$

According the results of Problem 2 of Assignment 7, we have

$$A_{30:\overline{20}|}^1 = 0.05, \quad A_{30:\overline{20}|} = 0.5.$$

Therefore,

$$\begin{aligned} 1000\bar{A}_{30:\overline{20}|} &= 1000 \left[ \bar{A}_{30:\overline{20}|}^1 + A_{30:\overline{20}|} \right] \\ &= 1000 \left[ \frac{i}{\delta} A_{30:\overline{20}|}^1 + A_{30:\overline{20}|} \right] \\ &= 1000 \cdot 0.5507463052 \\ &= 550.75. \end{aligned}$$