Pstat 172B, Spring 2009: Quiz 7 Solutions.

1. For the policy without the rider, the level premium can be obtained by the equivalence principle

\[ 100000 \int_0^\infty v^t \cdot 0.001 e^{-0.001t} \, dt = \pi_1 \int_0^\infty v^t e^{-0.001t} \, dt \]

\[ \pi_1 = 100 \]

For the extra benefit and premium payments, the equivalence principle is once more applied

\[ 100000 \int_0^{10} v^t \cdot 0.0002 e^{-0.001t} \, dt = \pi_2 \int_0^{10} v^t e^{-0.001t} \, dt \]

\[ \pi_2 = 20 \]

Therefore, \( \pi_1 + \pi_2 = 120 \) is payable for the next 10 years and \( \pi_1 = 100 \) is payable after 10 years.

2. The benefit reserve at the end of year 2 is computed by

\[ _2V = 100000 \left( \int_0^\infty v^t \cdot 0.001 e^{-0.001t} \, dt + \int_0^8 v^t \cdot 0.0002 e^{-0.001t} \, dt \right) \]

\[ - \left( 100 \int_0^\infty v^t e^{-0.001t} \, dt + 20 \int_0^8 v^t e^{-0.001t} \, dt \right) \]

\[ = 0 \]