1. You are given that mortality follows the mortality table above and that $A_{106} = 0.934321$. Calculate the interest rate used to calculate the present value.
2. You are given that mortality follows Gompertz law and $i = 8\%$. Further, you are given that

$$X \cdot \overline{a}_0 = \int_0^\infty (1.08)^t \cdot \exp\{-0.002049593(1.05^t - 1)\} \cdot 1.05^t \, dt.$$ 

Determine $X$. Make sure you show your work.
1. You are given that mortality follows the mortality table above.

\[ Z \] is the present value random variable for a whole life insurance policy issued to (75) which pays a death benefit of 1000 at the end of the year of death.

Determine the \( \text{Var}[Z] \).
2. You are given that mortality follows Gompertz law and that
\[
\overline{A}_0 = 0.0002 \int_0^\infty (1.04)^t \exp\left(-\frac{0.0002}{0.0392207} (1.04^t - 1)\right) dt .
\]

Determine the interest rate used to calculate \(\overline{A}_0\). Make sure you show your work.