Tutorial 3

1. Prove $\mathring{e}_x = \int_0^{\omega-x} {}_tp_x dt$
2. Prove that, assuming Uniform Distribution of Death, ${}_sq_x = sq_x$ for $0 \leq s \leq 1$
3. Prove that, assuming Constant Force of Mortality between non-integer ages, ${}_tp_x = e^{-t\mu}$ for $0 \leq t \leq 1$
   Find similar equations for approximating ${}_tp_{x+s}$ and ${}_{t+s}p_x$ where $0 \leq t + s \leq 1$.
4. Find, using two different assumptions, which you should state, ${}_{3.25}p_{57.6}$ assuming AM92 ultimate mortality.
5. If μ is a constant 0.01 for all ages, find q_x.
6. If $F_0(t) = \frac{t}{80}$ for $0 < t \leq 80$ and $F_0(t) = 1$ for $t > 80$, find the probability that a new-born:
   - dies no later than age 30
   - survives to age 50
   - dies after 30 but before 50
7. If $F_0(t) = 1 - e^{-0.01t}$ find the probability that:
   - a new-born dies before age 45
   - a new-born survies to 80
   - a new-born dies after 45 but before 80
   - a 20yr old survives to age 40
   - a 30yr old dies before age 80
8. If the force of mortality is a constant $\lambda > 0$ at all ages, find $\mathring{e}_x$ and e_x
9. If the force of mortality is a constant $\lambda > 0$ at all ages, find $var[T_x]$