

STAT 472
Quiz 2
Spring 2024
 January 23, 2024

1. (10 points) You are given that $S_0(x) = \frac{8100 - x^2}{8100}$ for $0 \leq x \leq 90$.

Calculate ${}_{3|4}q_{55} = S_{55}(3) - S_{55}(7) = {}_3P_{55} - {}_7P_{55}$

need $S_x(t) / {}_tP_x$

$$= \frac{S_0(x+t)}{S_0(x)} = \frac{\frac{8100 - (x+t)^2}{8100}}{\frac{8100 - x^2}{8100}}$$

$$S_x(t) = {}_tP_x = \frac{8100 - (x+t)^2}{8100 - x^2}$$

$$S_{55}(3) = \frac{8100 - (58)^2}{8100 - (55)^2} = 0.93320197$$

$$S_{55}(7) = \frac{8100 - (62)^2}{8100 - (55)^2} = 0.83862069$$

$${}_{3|4}q_{55} = 0.93320197 - 0.83862069 = \boxed{0.094581281}$$

$$\text{or } ({}_3P_{55})(4958) = 0.93320197 \left[1 - \frac{8100 - (62)^2}{8100 - (58)^2} \right] = 0.094581$$

2. You are given that $q_{80} = 0.0016t^2$ for $0 \leq t \leq 25$

a) (5 points) Calculate e_{80}° . $= \int_0^{25} {}_tP_{80} dt$

$$e_{80}^{\circ} = \int_0^{25} (1 - 0.0016t^2) dt$$

$$= \left[t - \frac{0.0016t^3}{3} \right] \Big|_0^{25}$$

$$= 25 - \frac{0.0016(25)^3}{3} = \boxed{16.6}$$

b) (5 points) Calculate $\text{Var}(T_{80})$.

$$\text{var}[T_{80}] = E[T_{80}^2] - [E(T_{80})]^2$$

or

$$\text{recall } \text{var}[T_{80}] = 2 \int_0^{25} (t - 0.0016t^3) dt - (16.6)^2$$

$$= 2 \left[\frac{t^2}{2} - \frac{0.0016t^4}{4} \right] \Big|_0^{25} - (16.6)^2$$

$$= 2 \left[\frac{(25)^2}{2} - \frac{0.0016(25)^4}{4} \right] - (16.6)^2$$

$$= \boxed{34.722}$$