#1

(a) P(No claim in 2 days)

$$= P(\underbrace{N(2)}_{\lambda = 10} = 0) = e^{-10}.$$

(b) P(time b/w 3rd and 5th claim is more than 10h)

$$= P(\underbrace{X_4 + X_5}_{GAM(2, \frac{1}{5})} > \tfrac{10}{24})$$

or

$$= P(\underbrace{N(\tfrac{10}{24})}_{\lambda = 50/24} \le 2)$$

#1-2

(c) $E\left(\begin{matrix}\text{Time of}\\ \text{10th claim}\end{matrix}\right) = 10\,E\left[\begin{matrix}\text{time for}\\ \text{1 claim}\end{matrix}\right] = 10\,\frac{1}{5} = \boxed{2}$

(d) $X = \begin{cases} 3 & .6 \\ 7 & .4 \end{cases}$ $\qquad E(X) = 5.06$

$M_X(r) - 1 - (1+\theta)E(X)(r) = 0$

$\left(e^{3r}(.6) + e^{7r}(.4)\right) - 1 - 1.1(5.06) = 0$ $\qquad \boxed{r = 0.066}$

$\psi(100) \le e^{-r\,100} = \boxed{.00136}$

#2 combined.

$$X = \begin{cases} 1 & .9(1/6) = .12 \\ 3 & .6(5/6) = .5 \\ 7 & .4(5/6) = .33 \\ 20 & .3(1/6) = .05 \end{cases}$$

$E(X) = 4.93$

$E(X^2) = 40.79$

$V(X) = 16.49$

a)

$$e^{z}(.12) + e^{3z}(.5) + e^{7(z)}(.33) + e^{20z}(.05) - 1 - ((1.1)(4.93))z = 0$$

$$\gamma = \boxed{.021}$$

$$\psi(100) \le e^{-\gamma(100)} = \boxed{.1224}$$

per year. $\lambda = 6 \cdot (365)$.

b) $E(S) = E(N)E(X) = 6\,(4.93) \cdot 365 = 10796.7$

$V(S) = \lambda E(X^2) = 6\,(40.79) \cdot 365 = 89330.1$

$S \sim_{\text{approx.}} N\left(E(S),\ V(S) \right)$.

$C = (1.1)E(S)$

$P(C-S > 0) = P(C > S)$

$= P(S < C)$

$= P\left(N(0,1) < \frac{C - E(S)}{SD(S)} \right) = P(Z < 3.61) \approx 1.$

(b) Cont'd

$$X_1 = \begin{cases} 3 & .6 \\ 7 & .4 \end{cases} \qquad E(X_1) = 4.6, \quad E(X_1^2) = 25, \quad V(X_1) = 3.84$$

$$X_2 = \begin{cases} 1 & .7 \\ 20 & .3 \end{cases} \qquad E(X_2) = 6.7, \quad E(X_2^2) = 120.7, \quad V(X_2) = 75.81$$

$\cancel{E(X_4)}$ $\cancel{4}$

$$X = \begin{cases} X_1 & 5/6 \\ X_2 & 1/6 \end{cases}$$

$$E(X) = \frac{5}{6}(E(X_1)) + \frac{1}{6}E(X_2) = 4.95$$

$$E(X^2) = \frac{5}{6}E(X_1^2) + \frac{1}{6}E(X_2^2) = 40.95$$

$$V(X) = 40.95 - 4.95^2 = 16.45$$

$$\neq \frac{5}{6}V(X_1) + \frac{1}{6}V(X_1) = 15.835$$

#3

$N = 5$ claims per day

$X \sim U(0, 20)$ $\quad m = 10$

$\theta = 0.1$ $\quad c = 1.1(10) = 11$

$$e^{-zc} M_X(z) = 1$$

$$e^{-11z}\left[\frac{e^{20z} - 1}{20z}\right] = 1$$

solve for z. $\quad \delta = \boxed{.060}$

$$\psi(u) \leq e^{-100\delta} = \boxed{.00248}$$

#4

$$S(50) = \frac{93563}{10000}$$

$$\mu(45) = .002830$$ off the table

on

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