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HW 11

Problem 1

T/F

r.v. X   bin~   large n

by Central Limit Theorem
for _large value_ n (n > 30)
distribution is approx. normal

$\boxed{\text{TRUE}}$

Problem 2

$E(-0.05, 0.05)$

$E(e) = 0$

2 conditions

$Var(e) = (.05 + .05)^2 / 12 = \frac{1}{1200}$

< 5 or ≥ 5

To get   error ≥ 1 which rounded is 5 +

$$\begin{array}{ccccc|ccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \end{array}$$
$$\begin{array}{c|c} <5 & \geq 5 \\ \frac{1}{2} & \frac{1}{2} \end{array}$$

$\boxed{\frac{1}{2}}$ is the probability

$E(T) = 0$

$Var(t) = \frac{1000}{1200} = \frac{5}{6}$ $P(T > 1)$

Central Limit theorem

$P(Z > (1 - 0)/\sqrt{5/6}$

$= P(Z > 1.095$ $P(Z > 1.095)$

$\boxed{= .1368}$

Problem 3

$$P(x \geq a) \leq \frac{E[x]}{a} \qquad \text{where } E[x] = 28$$
$$V(x) = 16$$

Markov

given $P(x \geq a) \geq 0.90$

$\Rightarrow P(x \geq a) \leq 1 - .9$

$\frac{28}{a} \leq 0.10$

$a = \boxed{280}$ orders

chebyshev:

$$P(x \geq b^2) \leq \frac{E[x]}{b^2}$$

$$P(|x - E[x]| \geq b) \leq \frac{var.(x)}{b^2}$$

given $P(|x - E[x]| \geq b) \geq 0.90$

$\frac{var(x)}{b^2} \leq 0.10$

$16/b^2 \leq 0.10$

$b = \sqrt{160}$

$b = \boxed{12.65}$

Problem 4

$$\lambda = 2 \text{ calls / hr}$$
$$= 3 \text{ calls} / 1.5 \text{ hrs}$$

$$T \sim \text{Exp}(\lambda = 2/\text{hr})$$

$$f_T(t) = 2e^{-2t}, \quad t > 0$$

$$P(T < 1.5) = \int_0^{1.5} 2e^{-2t} dt = -e^{-2t}\Big|_0^{1.5}$$

$$= 1 - e^{-3}$$
$$= 0.9502$$

$$X \sim \text{Poisson } (\lambda = 3 \text{ calls}/\text{hrs})$$
$$\Rightarrow \text{ expected } \# \text{ calls } = \boxed{3}$$

Problem 5

$$2/\text{monm}$$

$$P(4 \text{ cases in next 3 mnhs?})$$

Poisson distr.

$$\text{mean} = 3/2 = 1.5/\text{mnth}$$

$$P(X = x) = \lambda^x e^{-\lambda}/x!$$

$$= P(x = 4) = 1.5^4 e^{(-1.5)}/4!$$

$$= 0.21 \times 0.223$$

$$\boxed{= 0.047}$$