$\boxed{10D}$ X = no. of defects in a pack

$X \sim B(8, 0.01)$

3(a) $P(X=0) = \binom{8}{0}(0.01)^0(0.99)^8$

$= 0.92274$

$P(X \geq 1) = 1 - 0.92274$

$= 0.0773$

<u>or</u> $1 -$ binomialcdf$(8, 0.01, 0)$

(ii) $P(X \leq 2) =$ binomialcdf$(8, 0.01, 2)$

(b) $P(X = 2 \mid X \geq 1)$

$= \dfrac{P(X=2 \cap X \geq 1)}{P(X \geq 1)} = \dfrac{P(X=2)}{P(X \geq 1)}$

$= \dfrac{0.002636}{0.0773} = 0.0341$

#8 $P(\underbrace{X \geq 1}_{\text{at least 1 success}}) = 1 - P(\text{all failures})$

$$= 1 - (0.4)^n \geq 0.95$$

$$-0.4^n \geq -0.05$$

$$0.4^n \leq 0.05$$

$$n \ln (0.4) \leq \ln 0.05$$

$$n \geq \frac{\ln 0.05}{\ln 0.4} = 3.2$$

$$\boxed{n \geq 4}$$

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10 #7.

$$p = Pr(P=0) = \frac{e^{-\lambda} \lambda^0}{0!} = e^{-\lambda}$$

$$Pr(P=1) = \frac{e^{-\lambda} \cdot \lambda^1}{1!} = \lambda e^{-\lambda}$$

$$Pr(P=2) = \frac{e^{-\lambda} \lambda^2}{2!} = \frac{1}{2}\lambda^2 e^{-\lambda}$$

$$p = e^{-\lambda} + \underbrace{\lambda e^{-\lambda}} + \underbrace{\tfrac{1}{2}\lambda^2 e^{-\lambda}}$$

$$p(\lambda) = \tfrac{1}{2}e^{-\lambda}\left(\lambda^2 + 2\lambda + 2\right)$$

$$p'(\lambda) = \tfrac{1}{2}e^{-\lambda}\left(\cancel{2\lambda} + \cancel{2}\right) + \left(\lambda^2 + \cancel{2\lambda} + \cancel{2}\right)\cdot\left(-\tfrac{1}{2}e^{-\lambda}\right)$$

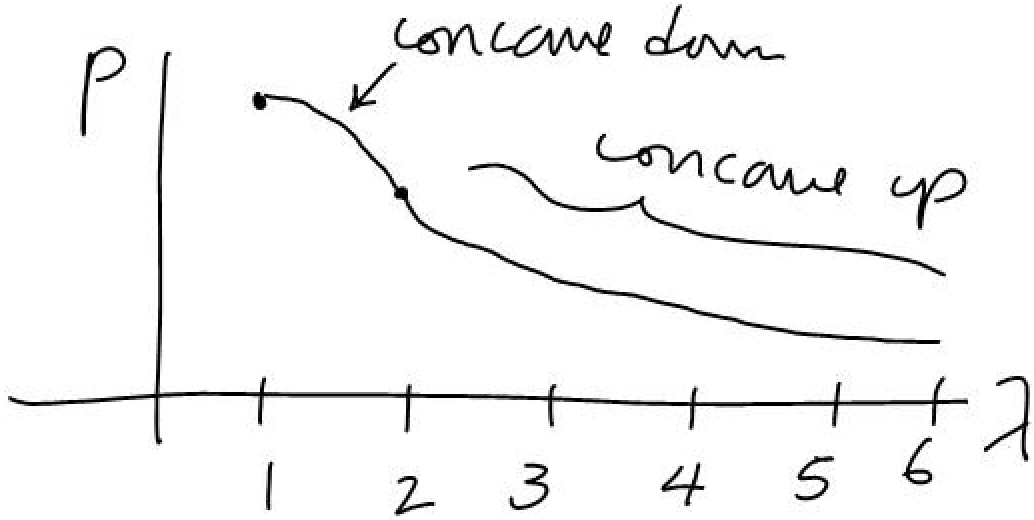
$$= -\tfrac{1}{2}e^{-\lambda}\left[\lambda^2\right]$$

$$= \frac{-\lambda^2}{2e^{\lambda}} < 0$$

$$p''(\lambda) = -\tfrac{1}{2}e^{-\lambda}\cdot 2\lambda + \lambda^2\cdot e^{-\lambda}\cdot\tfrac{1}{2}$$

$$= \tfrac{1}{2}\lambda e^{-\lambda}\left(-2 + \lambda\right) = 0$$

hypercritical value: $\lambda = 2$



#3 X = calls in a 1-hr period

$X \sim Po(12)$

(a) 3

(b) X = call in a 10-min period

$X \sim Po(2)$

$$P(X > 5) = 1 - P(X \leq 5)$$
$$= 1 - \text{poissoncdf}(2,5)$$
$$= 0.0166$$

Quiz 11-12-18

A yard averages 5 dandelions per square yard. The number of weeds follows a Poisson distribution.

(a) Write down the <u>exact</u> probability of a random square yard containing 6 dandelions.

(b) Find the probability of a 10 square yard region containing 47 dandelions.

Review

#1(a) $2a^2 + 3a + 3a^2 + 2a + 2a^2 + a = 1$

$7a^2 + 6a - 1 = 0$

$(7a - 1)(a + 1) = 0$

$a = 1/7$ or $\cancel{a = -1}$

$\frac{3}{49} + \frac{2}{7} = \frac{18}{49}$

$\frac{2}{49} + \frac{1}{7} = \frac{9}{49}$

(b) $E(X) = \frac{2}{49}(1) + \frac{3}{7}(2) + \frac{18}{49}(3) + \frac{9}{49}(4)$

$\frac{2}{49} + \frac{42}{49} + \frac{54}{49} + \frac{36}{49}$

$= \frac{134}{49}$

mode $= 2$ (happens the most, $\frac{3}{7}$ of the time).

$P(X \le 2) = \frac{2}{49} + \frac{3}{7} = \frac{2}{49} + \frac{21}{49} = \frac{23}{49} < 0.5$

$P(X \le 3) = \frac{23}{49} + \underbrace{\left(\frac{3}{49} + \frac{2}{7}\right)}_{P(X=3)} = \frac{40}{49} > 0.5$

median $= \frac{2+3}{2}$

#2