№1

$E_x = 300$ нер-во Маркова $P(x \geq A) \leq \dfrac{E_x}{A}$

а) ≥ 400 $\quad P(x \geq 400) \leq \dfrac{300}{400} = 0,75$

б) ≤ 500 $\quad P(x \leq 500) \geq 1 - \dfrac{300}{500} = 0,4$

№2

$n = 1600 \qquad p = 0,3 \qquad a = 50$

Нер-во Чебышева: $P(|\xi - E\xi| \geq a) \leq \dfrac{D\xi}{a^2}$

$D\xi = np(1-p) = 1600 \cdot 0,3(1-0,3) = 336$

$P(|\xi - E\xi| < a) \geq 1 - \dfrac{336}{50^2} = 0,8656$

№3

$X = [9, 5, 7, 7, 4, 10] \quad DX = 1$

$\overline{X} = \dfrac{9+5+7+7+4+10}{6} = 7$

$1 - \dfrac{\alpha}{2} = 0,995 \qquad Z_{\lambda} = 2,58 \qquad \overset{\longleftarrow}{\sqrt{DX} = 1}$

$P\left(\overline{X} - \dfrac{\sigma}{\sqrt{n}} Z_{\lambda} < X < \overline{X} + \dfrac{\sigma}{\sqrt{n}} Z_{\lambda}\right) \geq 0,99$

$P\left(7 - \dfrac{1}{\sqrt{6}} \cdot 2,58 < x < 7 + \dfrac{1}{\sqrt{6}} \cdot 2,58\right) \geq 0,99$

$$P(5,95 < X < 8,05) = 0,95$$

N4

$$X_i \sim N(\mu, \delta^2)$$

$$f(\mu, \delta^2)(y) = \frac{1}{\sqrt{2\pi\delta^2}} e^{-\frac{(y-\mu)^2}{2\delta^2}}$$

$$f(X, \mu, \delta^2) = \prod_{i=1}^{n} \frac{1}{\sqrt{2\pi\delta^2}} e^{-\frac{(x_i-\mu)^2}{2\delta^2}} =$$

$$= \frac{1}{(2\pi\delta^2)^{n/2}} e^{-\sum_{i=1}^{n} \frac{(x_i-\mu)^2}{2\delta^2}}$$

$$L(X, \mu, \delta^2) = -\ln(2\pi)^{n/2} - \frac{n}{2}\ln\delta^2 - \sum_{i=1}^{n} \left(\frac{x_i-\mu}{2\delta^2}\right)^2$$

$$\frac{\partial L}{\partial \mu} = \frac{2\sum_{i=1}^{n}(x_i-\mu)}{2\delta^2} = \frac{n\bar{x} - n\mu}{\delta^2} = 0$$

$$\frac{\partial L}{\partial \delta^2} = -\frac{n}{2\delta^2} + \frac{\sum_{i=1}^{n}(x_i-\mu)^2}{2\delta^4} = 0$$

$$\hat{\mu} = \bar{x}, \quad \hat{\delta^2} = \frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2$$