

№ 8.1 – 8.5, 8.7, 8.8

Данное задание №9
 $\sqrt{8.1}$

$$m_x = 4 \quad \sigma_x = 0,4$$

$$\begin{aligned} \text{a) } P\{\xi \in \langle 3,5 \rangle\} &= \\ &= \Phi\left(\frac{5-4}{0,4}\right) - \Phi\left(\frac{3-4}{0,4}\right) = \\ &= \Phi(2,5) + \Phi(2,5) = \\ &= 0,4938 + 0,4938 = \underline{0,9876} \end{aligned}$$

$$\text{б) } P\{\xi \in \langle ?, ? \rangle\} = 0,8$$

$$\begin{aligned} \cancel{P\{-a < \frac{X - m_x}{\sigma_x} < a\}} &= \\ &= 2\Phi(a) - 1 = 0,8 \end{aligned}$$

Омбсман:
(3,4874; 4,5126)

$$\Phi(a) = 0,9 \Rightarrow a \approx 1,2816$$

$$\cancel{a \approx 1,2816} = \frac{X - 4}{0,4} = 1,2816 =$$

$$\begin{aligned} \Rightarrow X - 4 &= 1,2816 \cdot 0,4 \approx 0,5126 \\ (4 - 0,5126; 4 + 0,5126) &\approx (3,4874; 4,5126) \end{aligned}$$

$$\mu_x = 50$$

$$\sigma_x = 20$$

$$Y = 0,954$$

$$P\{|E - 50| \leq 3 \cdot 20\} =$$

$$P\{|E - 50| \leq 60\} = 0,954$$

$$0,954 = 2 \Phi_0\left(\frac{E}{20}\right)$$

$$0,477 = \Phi_0\left(\frac{E}{20}\right)$$

$$\frac{E}{20} = 2,00$$

$$\left(0,4772\right. \\ \text{Erwartungswert} \\ \left.0,4778\right)$$

$$E = 20 \cdot 2 = 40$$

$$\sqrt{8,3}$$

$$\mu_x = 7 \text{ cm}$$

$$\sigma_x = 0,04 \text{ cm}^2$$

$$\sigma = \sqrt{\sigma_x} =$$

$$= 0,2$$

$$P\{E \in \langle 6,7; 7,3 \rangle\} =$$

$$P = \frac{7,3 - 6,7}{7,3 - 6,7} = \frac{0,3}{0,6} = 0,5$$

$$\frac{6,7 - 7}{0,2} = -1,5$$

$$\frac{7,3 - 7}{0,2} = 1,5$$

$$P(\xi \in (-1,5; 1,5)) =$$

$$= \Phi(1,5) - \Phi(-1,5) =$$

$$= 0,4332 + 0,4332 = \underline{\underline{0,8664}}$$

$$M_x = ? \quad \sigma_x = ?$$

$$R_{av}(5,9)$$

$$M_x = \int_{-\infty}^{+\infty} x f(x) dx$$

$$D_x = M(\xi - M_x)^2 = M(\xi^2) - (M_x)^2$$

$$\sigma_x = \sqrt{D_x}$$

$$f(x) = \begin{cases} 9 - x^2, & \text{max } x \in [5, 9] \\ 0, & \text{min } x \in [5, 9] \end{cases}$$

$$m_x = \frac{5 + 9}{2} = 7$$

$$I_x = \int_5^9 (x - 7)^2 \cdot \frac{1}{9 - 5} dx$$

$$I_x = 0,25 \int_5^9 x^2 - 14x + 49 dx =$$

$$= \left[\frac{x^3}{3} - \frac{14x^2}{2} + 49x \right]_5^9 =$$

$$= \left[\frac{x^3}{3} - 7x^2 + 49x \right]_5^9 =$$

$$= \frac{9^3}{3} - 7 \cdot 9^2 + 49 \cdot 9 - \left(\frac{5^3}{3} - 7 \cdot 5^2 + 49 \cdot 5 \right) =$$

$$= \frac{729}{3} - \frac{1701}{3} - \frac{125}{3} + \frac{525}{3} =$$

$$= -324 - 1 - 133,3 =$$

$$u = X - 7 \quad du = dy$$

$$x = 5 \Rightarrow u = 5 - 7 = -2$$

$$x = 9 \Rightarrow u = 9 - 7 = 2$$

$$D_x = 0,25 \int_{-2}^2 u^2 du$$

$$D_x = 0,25 \cdot \left(\frac{u^3}{3} \Big|_{-2}^2 \right) =$$

$$= 0,25 \left(\frac{2^3}{3} - \frac{(-2)^3}{3} \right) =$$

$$= 0,25 \left(\frac{8}{3} + \frac{8}{3} \right) = \cancel{0,25} \frac{1}{3} \cdot \frac{16}{3} =$$

$$= \frac{16}{12} = \frac{4}{3}$$

$$\sigma_x = \sqrt{\frac{4}{3}} = 2\sqrt{\frac{1}{3}} \approx \underline{\underline{1,15}}$$

$$k = 2 \quad \sqrt{8.7} \quad P = 1 - P\{X \leq 2\}$$

$$\begin{aligned}
 P &= 1 - (P\{X=0\} \cdot P\{X=0\}) - \\
 &\quad - (P\{X=0\} \cdot P\{X=1\}) - \\
 &\quad - (P\{X=1\} \cdot P\{X=1\}) - \\
 &\quad - (P\{X=2\} \cdot P\{X=0\}) - \\
 &\quad - (P\{X=0\} \cdot P\{X=2\})
 \end{aligned}$$

$$P = 1 - \left(\frac{2^0}{0!} e^{-2} \cdot \frac{2^0}{0!} e^{-2} \right) -$$

$$- \left(\frac{2^0}{0!} e^{-2} \cdot \frac{2}{1!} e^{-2} \right) -$$

$$- \left(\frac{2}{1!} e^{-2} \cdot \frac{2^0}{0!} e^{-2} \right) -$$

$$- \left(\frac{2}{1!} e^{-2} \cdot \frac{2}{1!} e^{-2} \right) - \left(\frac{4}{2!} e^{-2} \cdot \frac{2^0}{0!} e^{-2} \right) -$$

$$- \left(\frac{2^0}{0!} e^{-2} \cdot \frac{4}{2!} e^{-2} \right) =$$

$$\begin{aligned}
 &= 1 - e^{-4} - 2e^{-4} - 2e^{-4} - 4e^{-4} - \\
 &\quad - 2e^{-4} - 2e^{-4} = \\
 &= 1 - 13e^{-4} = 1 - 13 \cdot 0,018 = \\
 &= 1 - 0,234 = \underline{\underline{0,766}}
 \end{aligned}$$

$$\sqrt{8.8}$$

$$\lambda_{\text{real}} = 60$$

$$\lambda = 60 \cdot \frac{0,5}{60} = 0,5$$

$$a) P(0) = \frac{0,5^0 e^{-0,5}}{0!} = e^{-0,5} \approx \underline{\underline{0,6065}}$$

$$b) P(1) = \frac{0,5^1 e^{-0,5}}{1!} = 0,5 \cdot e^{-0,5} \approx$$

$$\approx \underline{\underline{0,3033}}$$

$$c) P(2) = \frac{0,5^2 e^{-0,5}}{2!} = \frac{0,25 e^{-0,5}}{2} \approx$$

$$\approx \underline{\underline{0,0758}}$$

Дз № 8.11, 8.17, 8.15

$$e) P(K \geq 1) = 1 - P(0) = 1 - 0,6065 \approx \underline{\underline{0,3935}}$$

$$f) P(K \leq 2) = P(0) + P(1) + P(2) \approx 0,6065 + 0,3033 + 0,0758 = \underline{\underline{0,9856}}$$

$$\begin{array}{ccc} \sqrt{8.11} & & \\ m_x = 46 & \Delta_x = 25 & \sigma = \sqrt{\Delta_x} = 5 \end{array}$$

$$P(40 \leq X \leq 60) = \Phi_0\left(\frac{60-46}{5}\right) - \Phi_0\left(\frac{40-46}{5}\right) =$$

$$= \Phi_0(2,8) - \Phi_0(-1,2) =$$

$$= 0,4974 + 0,3849 = \underline{\underline{0,8823}}$$

$$\begin{array}{c} \sqrt{8.15} \\ [2; 8] \end{array}$$

$$M_x = \frac{2+8}{2} = \underline{\underline{5}}$$

$$I_x = \int_2^8 (x-5) \cdot \frac{1}{8-2} dx$$

$$u = x - 5 \quad du = dx$$

$$x = 2 \Rightarrow u = 2 - 5 = -3$$

$$x = 8 \Rightarrow u = 8 - 5 = 3$$

$$I_x = \frac{1}{6} \int_{-3}^3 u^2 du$$

$$I_x = \frac{1}{6} \left(\frac{u^3}{3} \Big|_{-3}^3 \right) =$$

$$= \frac{1}{6} \left(\frac{27}{3} - \frac{(-27)}{3} \right) = \frac{1}{6} \cdot \frac{54}{3} =$$

$$= \frac{54}{18} = 3$$

$$\sigma_x = \sqrt{3} = 1,7321$$

$$n_x = 2000$$

$$\sqrt{8.17}$$

$$x = 3000$$

$$\lambda = \frac{1}{m_x} = \frac{1}{2000}$$

$$P_{T(x)} = \lambda e^{-\lambda x} = \frac{e^{-\frac{5000}{2000}}}{\cancel{2000}} = e^{-2,5} = \underline{0,223}$$

$$= \frac{e^{-2,5}}{2000} = \frac{0,2231}{2000} = \underline{0,0001115}$$