РГР-2 Дудин А.А.

Вариант № 7

(21.7)

$H_1 = 0{,}2 \cdot 0{,}6 = 0{,}12 \to 1+\ 2+$

$H_2 = 0{,}8 \cdot 0{,}4 = 0{,}32 \to 1-\ 2-$

$H_3 = 0{,}2 \cdot 0{,}4 = 0{,}08 \Rightarrow 1+\ 2-$

$H_4 = 0{,}8 \cdot 0{,}6 = 0{,}48 \Rightarrow 1-\ 2+$

$P(A) = 0{,}12 + 0{,}08 + 0{,}48 = 0{,}68$ - вер. попад.

$P(H_4|A) = \frac{0{,}48}{0{,}68} \approx 0{,}7$ - вер. промаха

$\underline{21.7|}$ $f(x) = \begin{cases} 0, & x<0 \\ ax^2, & 0 \le x \le 2 \\ 0, & x>0 \end{cases} \Rightarrow \begin{cases} 0 & x<0 \\ \frac{3}{8}x^2 & 0 \le x \le 2 \\ 0 & x>0 \end{cases}$

$\int_0^2 ax^2 dx = 1 \Rightarrow \frac{8}{3}a = 1 \Rightarrow a = \frac{3}{8}$

$F(x)$: $x<0$: $F_0(x) = \int_{-\infty}^{x} 0 \cdot dx = 0$

$0 \le x \le 2$: $F(x) = \int_{-\infty}^{0} 0\,dx + \int_0^x \frac{3}{8}x^2 dx = \frac{1}{8}x^3$

$x>0$: $F(x) = \int_{-\infty}^{0} 0\,dx + \int_0^2 \frac{3}{8}x^2 dx + \int_2^{\infty} 0 \cdot dx = 1$

$F(x) = \begin{cases} 0 & x<0 \\ \frac{1}{8}x^3 & 0 \le x \le 2 \\ 1 & x>1 \end{cases}$

$M(x) = \int_0^2 \frac{3}{8}x^2 \cdot x\,dx = \frac{3}{2} = 1{,}5$

$D(x) = \int_0^2 \frac{3}{8}x^2 \cdot x^2 dx - (M(x))^2 = \frac{12}{5} - \frac{9}{4} = 0{,}15$

$\sigma(x) = \sqrt{\frac{3}{20}} \approx 0{,}387$

23.7 $f(x) = \begin{cases} 0 & x < 0 \\ ax^2 & 0 \le x \le 1 \\ 0 & x > 1 \end{cases} \Rightarrow \begin{cases} 0 & x < 0 \\ 3x^2 & 0 \le x \le 1 \\ 0 & x > 1 \end{cases}$

$\int_0^1 ax^2\,dx = 1 \Rightarrow \frac{a}{3} = 1 \quad a = 3$

$M(x) = \int_0^1 3x^2 \cdot x\,dx = 0,75$

$D(x) = \int_0^1 3x^2 x^2 \cdot dx = 0,6$

$\sigma = \sqrt{0,6} \approx 0,775$

$0 \le x \le 2 : F(x) = \int_0^1 3x^2\,dx = x^3 \quad F(x) = \begin{cases} 0 & x < 0 \\ x^3 & 0 \le x \le 1 \\ 1 & x > 1 \end{cases}$

24.7 $P(x) = \begin{cases} \frac{1}{b-a} & x \in [a, b] \\ 0, & x \notin [a, b] \end{cases} \quad a = -3, b = 5 \quad x_1 = -2, x_2 = 2$

$P(x) = \begin{cases} \frac{1}{b+3}, & x \in [-3, 5] \\ 0, & x \notin [-3, 5] \end{cases}$

1) $\int_{-3}^{5} \frac{1}{b+3}\,dx = 1 \Rightarrow \frac{8}{b+3} = 1 \Rightarrow b = 5$

$P(x) = \begin{cases} \frac{1}{8}, & x \in [-3, 5] \\ 0, & x \notin [-3, 5] \end{cases}$ 2) $M\xi = \int_{-3}^{5} \frac{1}{8} x\,dx = 1$

3) $D\xi = \int_{-3}^{5} \frac{1}{8} x^2\,dx - 1 = \frac{19}{3} - \frac{3}{3} = \frac{16}{3} \approx 5,3$

4) $F_n(x) = \int_{-3}^{x} \frac{1}{8}\,dx = \frac{x+3}{8}$
$-3 \le x \le 5$

$F(x) = \begin{cases} 0, & x < -3 \\ \frac{x+3}{8}, & -3 \le x \le 5 \\ 1, & x > 5 \end{cases}$

$P(-2; 2) = \int_{-2}^{2} \frac{1}{8}\,dx = \frac{1}{2}$

28.7

x	-2	-1	0	1	2	3
p	$\frac{1}{6}$	a	$\frac{1}{3}$	$\frac{1}{6}$	b	0

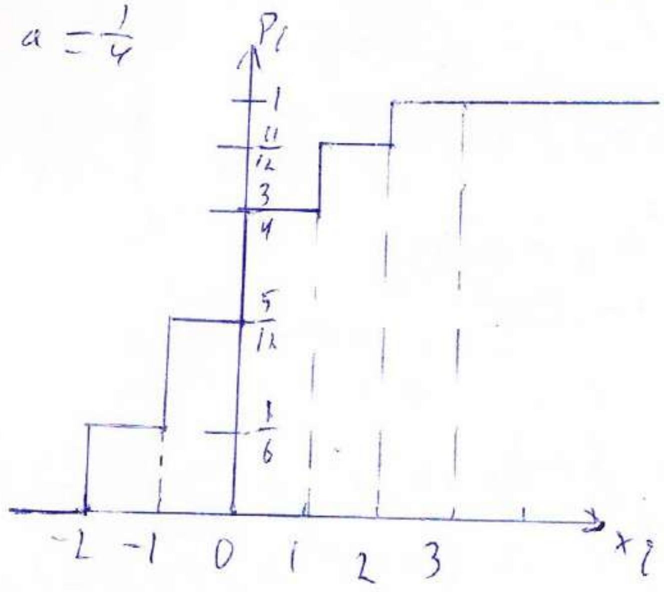
$M = -\frac{1}{4}$

$\sum p_i = 1 \Rightarrow \frac{2}{3} + a + b = 1 \quad \Rightarrow a + b = \frac{1}{3}$

$\sum p_i x_i = M = -\frac{1}{4} = -2 \cdot \frac{1}{6} - a + 0 + \frac{1}{6} + 2b + 0 \Rightarrow a = 2b + \frac{1}{12} \Rightarrow$

$\Rightarrow 2b + \frac{1}{12} + b = \frac{1}{3} \Rightarrow b = \frac{1}{12}$; $a = \frac{1}{4}$

$$F(x) \begin{cases} 0 & x \le -2 \\ \frac{1}{6} & -2 < x \le -1 \\ \frac{5}{12} & -1 < x \le 0 \\ \frac{3}{4} & 0 < x \le 1 \\ \frac{11}{12} & 1 < x \le 2 \\ 1 & 2 < x \le 3 \\ 1 & x > 3 \end{cases}$$



29.7

$$F(x) = \begin{cases} 0 & x \le 0 \\ (a-2)^2 x & 0 < x < 1 \\ 1 & x > 1 \end{cases} \qquad P(-1, \tfrac{1}{2}) = ?$$

$\int_0^1 (a-2)^2 dx = 1 \Rightarrow (a-2)^2 = 1 \Rightarrow a_1 = 1 ; a_2 = 3 \Rightarrow$

подходит любое a т.к. $(a-2)^2$ не меняется.

$$F(x) = \begin{cases} 0 & x \le 0 \\ x & 0 < x < 1 \\ 1 & x > 1 \end{cases} \qquad f(x) = \begin{cases} 0 & x \le 0 \\ 1 & 0 < x \le 1 \\ 0 & x > 1 \end{cases}$$

$M(x) = \int_0^1 x\, dx = 0{,}5 \qquad D(x) = \int_0^1 x^2 dx - (M(x))^2 = \frac{1}{3} - \frac{1}{4} \approx 0{,}083$

$\sigma(x) = \sqrt{\frac{1}{12}} \approx 0{,}289 \qquad P(-1 < x < \frac{1}{2}) = F(\frac{1}{2}) - 0 = 0{,}5$

30.22 $f(x) = \begin{cases} 0 & x \le -2 \\ a(x-2)^3 & -2 < x \le 2 \\ 0 & x > 2 \end{cases}$ $P(-3,1) = ?$

1) $\int_{-2}^{2} a(x-2)^3 dx = 1 \Rightarrow -64a = 1 \Rightarrow a = -\frac{1}{64}$

$f(x) = \begin{cases} 0 & x \le -2 \\ -\frac{1}{64}(x-2)^3 & -2 < x \le 2 \\ 0 & x > 2 \end{cases}$

2) $-2 < x \le 2$: $F(x) = \int_{-\infty}^{-2} 0\,dx + \int_{-2}^{x} -\frac{1}{64}(x-2)^3 dx = 1 - \frac{(x-2)^4}{256}$

$F(x) = \begin{cases} 0, & x \le -2 \\ 1 - \frac{(x-2)^4}{256}, & -2 < x \le 2 \\ 1, & x > 2 \end{cases}$

$P(-3;1) = \int_{-3}^{1} -\frac{1}{64}(x-2)^3 dx = \int_{-2}^{1} -\frac{1}{64}(x-2)^3 dx \approx 0,996.$

3) $M(x) = \int_{-2}^{2} \left(-\frac{1}{64}(x-2)^3 \cdot x\right) dx \approx -1,2$

4) $D(x) = \int_{-2}^{2} \left(-\frac{1}{64}(x-2)^3 \cdot x^2\right) dx \approx 1,87$

5) $\sigma = \sqrt{D(x)} \approx 1,37$

31.22 $a = 9$, $\sigma = 4$, $\alpha = 15$, $\beta = 19$, $\delta = 18$

$P(\alpha < x < \beta) = F(\beta) - F(\alpha)$

$P(15 < x < 19) = F(19) - F(15) = \Phi\left(\frac{19-9}{4}\right) - \Phi\left(\frac{15-9}{4}\right) = \Phi(2,5) - \Phi(1,5) =$

$= 0,4938 - 0,4332 = 0,0606$

$P(|x-a| \le \delta) = 2\Phi\left(\frac{\delta}{\sigma}\right)$

$P(|x-a| \le 18) = 2\Phi\left(\frac{18}{4}\right) = 2\Phi(4,5) = 2 \cdot 0,499997 = 0,99994$