# Д/З №2.

**№1.** $z=7,\ y=16$

$$(x \neq y) \wedge (\neg(y<x) \to (2z>x)) \wedge ((x<y) \to (x>2z))$$

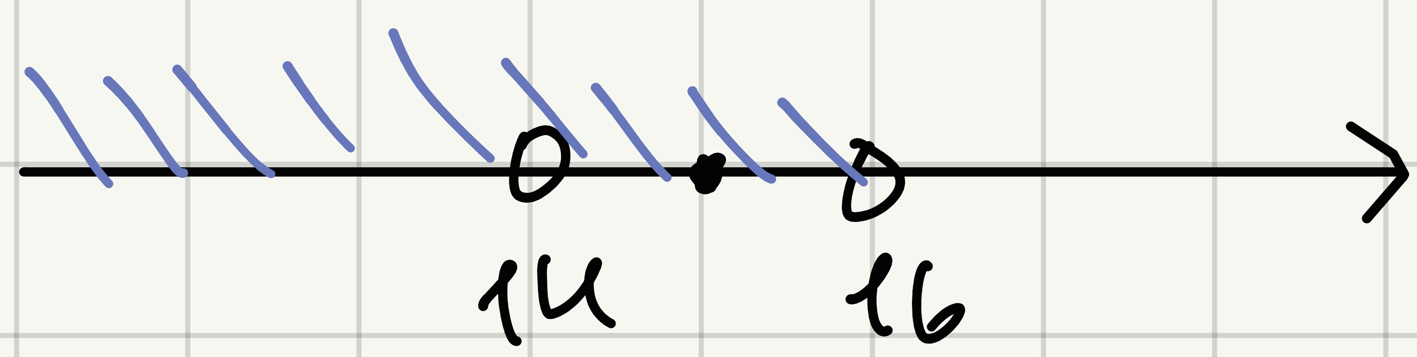
$$(x \neq y) \wedge (y \geq x \vee 2z>x) \wedge (x \geq y \vee x>2z) = 1$$

$$(x \neq 16) \wedge (x \leq 16 \vee x<14) \wedge (x \geq 16 \vee x>14) = 1$$

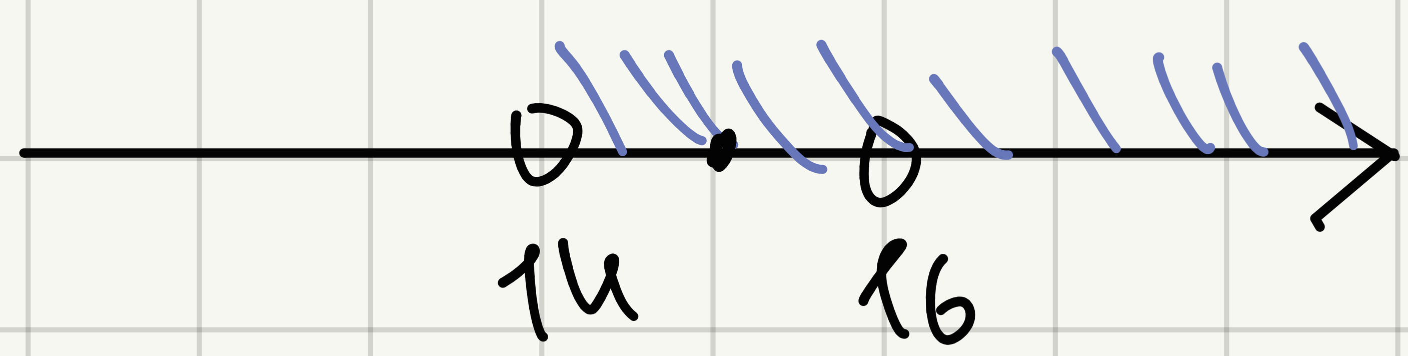
$$\Updownarrow$$

$$\begin{cases} x \neq 16 & - 1 \\ \left[\begin{array}{l} x \leq 16 \\ x < 14 \end{array}\right. & - 1 \\ \left[\begin{array}{l} x \geq 16 \\ x > 14 \end{array}\right. & - 1 \end{cases}$$

1




2




$$\Downarrow$$

$$x = 15$$

Ответ: $x=15$

**№2** $f(x,y,z) = \overline{((x \wedge \bar{y}) \wedge z)}$

| $x$ | $y$ | $z$ | $x \wedge \bar{y}$ | $\overline{(x \wedge \bar{y}) \wedge z}$ |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 |

## № 3

$$1 \oplus x_1 \oplus x_2 = (x_1 \to x_2) \wedge (x_2 \to x_1)$$

| $x_1$ | $x_2$ | $1 \oplus x_1 \oplus x_2$ | $(x_1 \to x_2) \wedge (x_2 \to x_1)$ |
|---|---|---|---|
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |

2.т.д. //

№4

а) $x \wedge (y \to z) \overset{?}{=} (x \wedge y) \to (x \wedge z)$

| x | y | z | 1 | 2 |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | |
| 0 | 1 | 0 | 0 | |

...

Ответ: нет

б) $x \oplus (y \equiv z) \overset{?}{=} (x \oplus y) \equiv (x \oplus z)$

| x | y | z | 1 | 2 |
|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |

Ответ: нет.

№5

а) $x \to y \overset{?}{=} y \to x$

| $x$ | $y$ | $x \to y$ | $y \to x$ |
|---|---|---|---|
| 1 | 0 | 0 | 1 |

Ответ: нет.

б) $(x \to y) \to z \overset{?}{=} x \to (y \to z)$

(1) — $(x \to y)$, (2) — $(y \to z)$

| $x$ | $y$ | $z$ | 1 | 2 |
|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 1 |

Ответ: нет.

№6

а)

| | $x_1$ | $x_2$ | $x_3$ | $f$ |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 |
| 3 | 0 | 1 | 0 | 1 |
| 4 | 0 | 1 | 1 | 1 |
| 5 | 1 | 0 | 0 | 1 |
| 6 | 1 | 0 | 1 | 1 |
| 7 | 1 | 1 | 0 | 0 |
| 8 | 1 | 1 | 1 | 0 |

$f\overset{(1)}{(0,0,0)} = 0$

$f\overset{(5)}{(1,0,0)} = 1$ $\Rightarrow$ $x_1$ сущ.

$f\overset{(1)}{(0,0,1)} = 0$

$f\overset{(4)}{(0,1,1)} = 1$ $\Rightarrow$ $x_2$ сущ

$f\overset{(7)}{(1,1,0)} = 0$

$f\overset{(8)}{(1,1,1)} = 0$ $\Rightarrow$ $x_3$ фикт.

5) $g(x_1, x_2, x_3) = (x_1 \to (x_1 \vee x_2)) \to x_3 =$

$= (\bar{x}_1 \vee (x_1 \vee x_2)) \to x_3 = 1 \to x_3 = x_3$

$x_1, x_2$ — фикт $x_3$ — сущ. //

**№7**

$f(x_1, \dots, x_n) = (x_1 \vee f(0, x_2, \dots x_n)) \wedge (\bar{x}_1 \vee f(1, x_2, \dots, x_n))$

$x_1 = 0$: $(0 \vee f(0, x_2, \dots x_n)) \wedge ((1 \vee f(1, x_2, \dots x_n)) =$

$= f(0, x_2, \dots, x_n)$ ✓

$x_1 = 1$: $(1 \vee f(0, x_2, \dots, x_n)) \wedge ((0 \vee f(1, x_2, \dots, x_n)) =$

$= f(1, x_2, \dots, x_n)$ ✓

**№8** $x^1 = x$, $x^0 = \bar{x}$; $\alpha = \{\alpha_1, \alpha_2, \dots, \alpha_n\}$

$f_\alpha(x_1, \dots, x_n) = x_1^{\alpha_1} \wedge \dots \wedge x_n^{\alpha_n}$

если $\alpha_i = 0$, то $\alpha_i^{\alpha_i} = 0^0 = 1$

если $\alpha_i = 1$, то $\alpha_1^{\alpha_i} = 1^1 = 1$

т.е., если $x_i \neq \alpha_i$, то

$x_i = 0$, $\alpha_i = 1$ $\to$ $x_i^{\alpha_i} = 0$

$x_i = 1, \alpha_i\, 0 \to x_i^{\alpha_i} = 0$

в конъюнкции найдется член, который обратит выражение в 0.

$\Rightarrow f_\alpha(x_1, \dots, x_n) = 1$, тогда и только тогда, когда $\alpha = \{x_1, \dots, x_n\}$

№9

$$\bigvee_{ij}(x_i \oplus x_j) \overset{?}{=} (x_1 \vee \dots \vee x_n) \wedge$$
$$\wedge (\bar{x}_1 \vee \dots \vee \bar{x}_n)$$

$$x_i \oplus x_j = x_i \wedge \bar{x}_j \vee x_j \wedge x_i$$

и пройдемся по всем $i, j$, и выберем пары

раскроем по дистрибут. закону

$$(x_1 \vee \dots \vee x_n) \wedge (\bar{x}_1 \vee \dots \vee \bar{x}_n) = x_1 \wedge \bar{x}_2 \vee x_2 \wedge x_1 \dots =$$
$$= (x_i \oplus x_j) \vee \dots = \bigvee_{ij}(x_i \oplus x_j)$$

ч.т.д.//