Д/З 3

Доведіть:

(1) $\overline{X_1 \vee X_2} = \overline{X}_1 \wedge \overline{X}_2$

(2) $\overline{X_1 \wedge X_2} = \overline{X}_1 \vee \overline{X}_2$

(3) $\overline{\overline{X}} = X$

(4) $(X_1 \vee X_2) \wedge X_3 = (X_1 \wedge X_3) \vee (X_2 \wedge X_3)$

(5) $X_1 \wedge X_2 = X_2 \wedge X_1$

(6) $(X_1 \wedge X_2) \wedge X_3 = X_1 \wedge (X_2 \wedge X_3)$

(7) $X \wedge X = X$

(8) $(X_1 \wedge \overline{X}_1) \wedge X_2 = (X_1 \wedge \overline{X}_1)$

(9) $(X_1 \wedge \overline{X}_1) \vee X_2 = X_2$

(10) $X_1 \vee X_2 = X_2 \vee X_1$

(11) $(X_1 \vee \overline{X}_1) \wedge X_2 = X_2$

(12) $(X_1 \vee X_2) \vee X_3 = X_1 \vee (X_2 \vee X_3)$

(13) $X \vee X = X$

(14) $X_1 \wedge \overline{X}_1 = X_2 \wedge \overline{X}_2$

3.1 2) $X_1 \cdot ((X_2 \cdot X_3) \cdot X_4) = (X_1 \cdot (X_2 \cdot X_3)) \cdot X_4 = ((X_1 \cdot X_2) \cdot X_3) \cdot X_4$ т.ч.д.

3.3 3) $\overline{X} = \overline{X}(y \vee \overline{y}) = \overline{x}(y \vee \overline{y})(z \vee \overline{z}) = (\overline{x}y \vee \overline{x}\,\overline{y})(z \vee \overline{z}) =$

$= (\overline{x}y(z \vee \overline{z})) \vee (\overline{x}\,\overline{y}(z \vee \overline{z})) = \overline{x}yz \vee \overline{x}y\overline{z} \vee \overline{x}\,\overline{y}z \vee \overline{x}\,\overline{y}\,\overline{z}$

6) $xyz \vee \overline{x \vee y \vee z} = xyz \vee \overline{x}\,\overline{y}\,\overline{z}$

3.8 5) $F_1 = \overline{(x \vee \overline{y}) \cdot (\overline{x} \vee y)} \cdot xy \vee (\overline{x}y \cdot xy) \vee \overline{x} \cdot \overline{y}$

$F_2 = x \vee y$

$F_1 = \overline{(x \vee \overline{y}) \cdot (\overline{x} \vee y)} \cdot xy \vee (\overline{x}y \cdot xy) \vee \overline{x} \cdot \overline{y} = \left(\overline{(x \vee \overline{y})} \vee \overline{(\overline{x} \vee y)}\right) xy \vee$

$\vee (y(\overline{x} \cdot x)) \vee \overline{x} \cdot \overline{y} = (\overline{x}y \vee x\overline{y})xy \vee (\overline{x} \cdot x) \vee \overline{x} \cdot \overline{y} = (\overline{x}y \vee x\overline{y})xy \vee \overline{x}\,\overline{y}$

$= (\overline{x} \cdot x)y \vee (\overline{y} \cdot y)x \vee \overline{x}\,\overline{y} = \overline{x}\,\overline{y} = \overline{x \vee y} = F_2$ т.ч.д.

6) $F_1 = \overline{x}\,\overline{z} \vee xy \vee x\overline{z}$

$F_2 = \overline{(\overline{y}z) \cdot (x \vee \overline{z})}$

$F_1 = \overline{x}\,\overline{z} \vee xy \vee x\overline{z} = \overline{z}(\overline{x} \vee x) \vee xy = \overline{z} \vee xy$

$F_2 = \overline{(\overline{y}z) \cdot (x \vee \overline{z})} = xy \vee y\overline{z} \vee x\overline{z} \vee \overline{z} = \overline{z} \vee xy$ $\Rightarrow F_1 = F_2$ т.ч.д.

7) $F_1 = \left(\left(\overline{x\overline{y} \vee \overline{x}y}\right) \vee (x \vee y)\right)\left(\left(\overline{x \vee y}\right) \vee (x \vee y)(\overline{x} \vee \overline{y})\right)$ $F_2 = \overline{xy} = \overline{x} \vee \overline{y}$

$F_1 = \left(\left(\overline{x\overline{y}}\right)\left(\overline{\overline{x}y}\right) \vee x \vee y\right)(\overline{x}\,\overline{y} \vee x\overline{x} \vee y\overline{x} \vee y\overline{y}) = ((\overline{x} \vee y)(x \vee \overline{y}) \vee x \vee y) \cdot$

$\cdot (\overline{x}\,\overline{y} \vee x\overline{y} \vee \overline{x}y) = (x \vee y \vee \overline{x}\,\overline{y})(\overline{x} \vee x\overline{y}) = x\overline{y} \vee \overline{x}y \vee \overline{x}\,\overline{y} = \overline{x} \vee x\overline{y} =$

$= \overline{x} \vee \overline{y} = F_2$ т.ч.д.

8) $F_1 = \overline{x\overline{y} \cdot (x\overline{y}z \vee \overline{x}y\overline{z})}$ $F_2 = \overline{\overline{y}xz} \cdot (\overline{x} \vee y)$

$F_1 = \overline{x\overline{y}} \vee \overline{(x\overline{y}z \vee \overline{x}y\overline{z})} = \overline{x} \vee y \vee (\overline{x\overline{y}z})(\overline{x}y\overline{z}) = \overline{x} \vee y \vee (\overline{x} \vee y \vee z)(\overline{x}y\overline{z}) =$

$= \overline{x} \vee y \vee \overline{x}y\overline{z} = \overline{x} \vee y$

$F_2 = (y \vee \overline{x} \vee \overline{z})(\overline{x} \vee y) = \overline{x}y \vee \overline{x} \vee y = F_1$ т.ч.д.

9) $F_1 = (x \vee \overline{(\overline{y} \vee \overline{z})})(y \vee z)$ $F_2 = (x \vee y)(z \vee \overline{\overline{x} \vee \overline{y}})(x \vee y \vee z)$

$F_1 = (x \vee yz)(y \vee z) = xy \vee yz \vee xz$

$F_2 = (x \vee y)(z \vee xy)(xy \vee z) = xz \vee yz \vee xy$ $\Rightarrow F_1 = F_2$ т.ч.д.