$xx = x$ $x\overline{x} = 0$

$$f(A,B,C,D) = AC(A \oplus D) + \overline{B}C = ACA\overline{D} + AC\overline{A}D + \overline{B}C = AC\overline{D} + \overline{B}C$$ ← **SOP**

$x + \overline{x} = 1$ $x + x = x$

$$AC\overline{D} + \overline{B}C = A(B + \overline{B})C\overline{D} + (A + \overline{A})\overline{B}C(D + \overline{D}) = ABC\overline{D} + A\overline{B}C\overline{D} + A\overline{B}CD + A\overline{B}C\overline{D} + \overline{A}\,\overline{B}CD + \overline{A}\,\overline{B}C\overline{D}$$

$$f(A,B,C,D) = ABC\overline{D} + A\overline{B}C\overline{D} + A\overline{B}CD + \overline{A}\,\overline{B}CD + \overline{A}\,\overline{B}C\overline{D} = \sum_m(\mathbf{2},\mathbf{3},\mathbf{10},\mathbf{11},\mathbf{14})$$

1110 1010 1011 0011 0010

$x + yz = (x + y)(x + z)$ *distributiva*

$$f(A,B,C,D) = AC\overline{D} + \overline{B}C = C(A\overline{D} + \overline{B}) = C(A + \overline{B})(\overline{D} + \overline{B})$$ ← **POS**

$x\overline{x} = 0$

$$(A + \overline{B}) = (A + \overline{B} + C\overline{C}) = (A + \overline{B} + C)(A + \overline{B} + \overline{C}) = (A + \overline{B} + C + D\overline{D})(A + \overline{B} + \overline{C} + D\overline{D}) =$$

$$= (A + \overline{B} + C + D)(A + \overline{B} + C + \overline{D})(A + \overline{B} + \overline{C} + D)(A + \overline{B} + \overline{C} + \overline{D})$$

0100 0101 0110 0111

$$(\overline{D} + \overline{B}) = (A\overline{A} + \overline{B} + \overline{D}) = (A + \overline{B} + \overline{D})(\overline{A} + \overline{B} + \overline{D}) = (A + \overline{B} + C\overline{C} + \overline{D})(\overline{A} + \overline{B} + C\overline{C} + \overline{D}) =$$

$$= (A + \overline{B} + C + \overline{D})(A + \overline{B} + \overline{C} + \overline{D})(\overline{A} + \overline{B} + C + \overline{D})(\overline{A} + \overline{B} + \overline{C} + \overline{D})$$

0101 0111 1101 1111

$$C = (A\overline{A} + B\overline{B} + C + D\overline{D}) = (A + B + C + D)(\overline{A} + B + C + D)(A + \overline{B} + C + D)(\overline{A} + \overline{B} + C + D)\cdot$$

0000 1000 0100

$$\cdot(A + B + C + \overline{D})(\overline{A} + B + C + \overline{D})(A + \overline{B} + C + \overline{D})\,(\overline{A} + \overline{B} + C + \overline{D})$$

0001 1001 0101 1101

$$f(A,B,C,D) = \prod_M(\mathbf{0},\mathbf{1},\mathbf{4},\mathbf{5},\mathbf{6},\mathbf{7},\mathbf{8},\mathbf{9},\mathbf{12},\mathbf{13},\mathbf{15})$$

$\bar{\bar{x}} = x$ $\quad\overline{(x+y)} = \bar{x}\cdot\bar{y}$ *De Morgan*

$$f(A,B,C,D) = AC\bar{D} + \bar{B}C = \overline{\overline{AC\bar{D} + \bar{B}C}} = \overline{AC\bar{D}}\cdot\overline{\bar{B}C} = \overline{AC\bar{D}\bar{D}}\cdot\overline{\bar{B}\bar{B}C}$$

$xx = x$

NAND

$$= \overline{\overline{AC\bar{D}\bar{D}}\cdot\overline{\bar{B}\bar{B}C}} = \overline{AC\bar{D}}\cdot\overline{\bar{B}C} = \overline{\overline{A\bar{C}}\cdot D\bar{D}}\cdot\overline{\bar{B}\bar{B}C} = \overline{\overline{A\bar{C}}\cdot\overline{A\bar{C}}\,D\bar{D}}\cdot\overline{\bar{B}\bar{B}C}$$

NAND 2 entradas

$\bar{\bar{x}} = x$ $\quad\overline{(x\cdot y)} = \bar{x} + \bar{y}$ *De Morgan*

$$f(A,B,C,D) = C(A+\bar{B})(\bar{D}+\bar{B}) = \overline{\overline{C(A+\bar{B})(\bar{D}+\bar{B})}} = \overline{\bar{C} + \overline{(A+\bar{B})} + \overline{(\bar{D}+\bar{B})}}$$

$$= \overline{\overline{\bar{C}+\bar{C}} + \overline{(A+\overline{\bar{B}+\bar{B}})} + \overline{(\overline{(D+D)}+)\overline{B+B}})}$$

NOR

$$= \overline{\overline{(C+C+C+C)} + \overline{(C+C+C+C)} + \overline{(A+A+A+\overline{(B+B+B+B)})} + \overline{(\overline{(D+D+D+D)} + \overline{(B+B+B+B)} + \overline{(B+B+B+B)} + \overline{(B+B+B+B)})}}$$

$x + x = x$

NOR 4 entradas