6 - Canonical Forms

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CANONICAL (STANDARD) FORM

def a standard way to represent all truth tables

* SOP (sum of product) form
  - each row has a minterm
    assumption - each minterm is true
  - we can form a function by ORing minterm where output is 1
    ∴ becomes the sum of products

A	B	Y	minterm	minterm name
0	0	0	$\bar{A}\bar{B}$	m_0
0	1	1	$\bar{A}B$	m_1
1	0	0	$A\bar{B}$	m_2
1	1	1	AB	m_3

$$Y = F(A, B) = \bar{A}B + AB = \Sigma(1, 3)$$

  - the literals in the minterm are complemented or not so that the whole miterm is true

* POS (product of sum) form
  - each row has a maxterm
    assumption - each maxterm is false
  - form function by ANDing maxterms where output is false (0)

A	B	Y	maxterm	maxterm name
0	0	0	$A + B$	M_0
0	1	1	$A + \bar{B}$	M_1
1	0	0	$\bar{A} + B$	M_2
1	1	1	$\bar{A} + \bar{B}$	M_3

$$Y = F(A, B) = (A + B)(\bar{A} + B) = \Pi(0, 2)$$

  - the literals in the minterm are complemented or not so that the whole miterm is false

SOP Vs POS

N.B.
- SOP and POS are logically equivalent
- SOP produces a shorter equation when the output is TRUE on only a few rows of a truth table
- POS is shorter when the output is FALSE on only a few rows of a truth table