Canonical and standard forms

These are different forms of Boolean expressions that are most commonly used than others for simplification of logic expressions. The most important of these are 1. SOP(Sum Of Products) 2. POS(Product Of Sum)

Minterm:

A product term which contains each of n variables as factors in either complemented or uncomplemented form is called minterm. It is represented by 'm'.

Maxterm:

A sum term which contains each of n variables as factors in either complemented or uncomplemented form is called maxterm. It is represented by 'M'.

SOP:

Any mathematical expression in which an addition operator is applied to two or more sub-expressions each of which is an application of a multiplication operator. The most common case would be scalar addition and multiplication.

Example: AB + CD but the term is used for kinds of operators with similar properties such as AND and OR in Boolean algebra i.e., (A AND B) OR (C AND D)

POS:

The sum term is any group of literals appearing either in complemented or uncomplemented form, that are ORed together. Two or more sum terms are ANDed together to form a POS expression.

Example: $F=(A+B^1+C^1)(A^1+B+C^1+D^1)(B+D)(C^1+D^1)$

Canonical/Standard SOP:

A SOP expression is referred to as canonical/Standard SOP expression if every product term involves every variable either in complemented or uncomplemented form.

Example: $F=A^1BC^1D^1+ABC^1D^1+A^1B^1C^1D$

Canonical/Standard POS:

A POS expression is referred to as canonical/Standard POS expression if every sum term involves every variable either in complemented or uncomplemented form.

Example: $F=(A^1+B^1+C^1+D)(A^1+B+C^1+D^1)(A+B+C^1+D)(A^1+B^1C^1+D^1)$

Conversion from SOP to canonical/Standard SOP:

To convert SOP to canonical SOP form, the following steps are required.

1. Examine each term, if it is a minterm, retain it and continue to the next term.
2. Which is not minterm in the product, check the variables that do not occur, for each Xi that does not occur, multiply the product by $(Xi+Xi^1)$
3.Multiply all products and eliminate redundant terms.

Conversion from POS to canonical/Standard POS:

To convert POS to canonical POS form, the following steps are required.

1. Examine each term, if it is a maxterm, retain it and continue to the next term.
2. Which is not maxterm in the product, check the variables that do not occur, for each Xi that does not occur, add the sum by $(Xi\ Xi^1)$.
3.Add all sums and eliminate redundant terms.

Dual of Logical Expressions:

For every proposition involving logical addition and multiplication ("or" and "and"), there is a corresponding proposition in which the words "addition" and "multiplication" are interchanged.

Example: (x+y = x - ~ y – 1) is dual of (x-y = x + ~ y + 1) (where ~ represents propositional negation) I only know how to find dual of expressions which have only ^ and v operators, tell me how to deal with dual of + and - .