

EECS150 - Digital Design  
Lecture 5 - Boolean Algebra II

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# Outline

- Canonical Forms
  - They give us a method to go from truth tables (TT) to Boolean Equations
- Two-level Logic Simplification
  - K-map method
- Multi-level Logic
- NAND/NOR networks
- EXOR revisited

# Canonical Forms

- Standard form for a Boolean expression - *unique* algebraic expression directly from a true table (TT) description.
- Two Types:
  - \* *Sum of Products (SOP)*
  - \* *Product of Sums (POS)*
- **Sum of Products** (disjunctive normal form, minterm expansion).

*Example:*

minterms	a	b	c	f	f'
a'b'c'	0	0	0	0	1
a'b'c	0	0	1	0	1
a'bc'	0	1	0	0	1
a'bc	0	1	1	1	0
ab'c'	1	0	0	1	0
ab'c	1	0	1	1	0
abc'	1	1	0	1	0
abc	1	1	1	1	0

One product (and) term for each 1 in f:

$$f = a'bc + ab'c' + ab'c + abc' + abc$$

$$f' = a'b'c' + a'b'c + a'bc'$$