

## Discrete Math Tautology and Contradiction

\* Sometime a statement form will have the value "T" for every possible combination of truth values for the constitute statement variables, such a statement is called a "Tautology"

Example

$$p \vee \neg p$$

$p$	$\neg p$	$p \vee \neg p$
T	F	T
F	T	T

"This is a tautology"

\* Sometimes a statement form will have the value "F" for every possible combination of truth values for the constitute statement variables, such a statement is called a "Contradiction"

Example

$$p \wedge \neg p$$

$p$	$\neg p$	$p \wedge \neg p$
T	F	F
F	T	F

" $p \wedge \neg p$  is a contradiction"

Example.

Let "t" be a tautology and let "c" be a contradiction  
 Show that  $p \wedge t \equiv p$  and  $p \vee c \equiv p$

p	t	$p \wedge t$
T	T	T
T	T	T
F	T	F
F	T	F

p	c	$p \vee c$
T	F	T
T	F	T
F	F	F
F	F	F

$p \wedge t \equiv p$  "Same truth table values"

$p \vee c \equiv p$  "Same truth table values"

\*  $p \wedge t \equiv p$  and  $p \vee c \equiv p$  are called "Identity Laws"