COT 3100 1/12/23

Reminders

(1) Lab/Recitation meeting this week (18-24)

(2) Please take Diagnostic Quiz (1 HR online MC)

(3) Acquaint w/ course web page
www.cs.ucf.edu/courses/cot3100/spr2023

my homepage: www.cs.ucf.edu/~dmarino

*(4) After today start on Hmk #1.

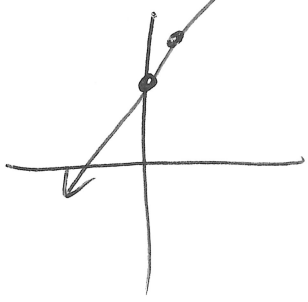
Boolean Logic (Weeks 1-2)

Boolean Variables + Expressions + Operators
Truth Tables
Laws of Logic
Rules of Inference

Algebra Class

$f(x) = 2x+5$

$x \in R$

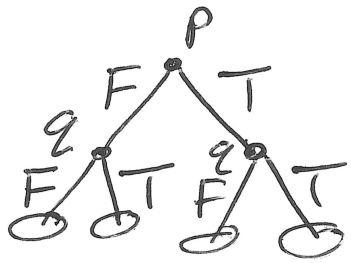


x	f(x)
0	5
1	7
2	9
⋮	⋮

Boolean Variable can equal True or False.
Most books: p, q, r, etc. (commonly used)

Boolean Operators

∧ AND



now table = 2^n
n = # variable expr

p	q	p ∧ q (func)
F	F	F
F	T	F
T	F	F
T	T	T

∨ OR

p	q	p ∨ q
F	F	F
F	T	T
T	F	T
T	T	T

⊕ XOR

p	q	p ⊕ q
F	F	F
F	T	T
T	F	T
T	T	F

$-, \neg$ NOT

p	$\bar{p}$
F	T
T	F

$\overline{p \wedge q}$ $\overline{p} \wedge q$

DIFFERENT

Expression: $p \wedge (q \vee \bar{r})$, Truth Table

p	q	r	$q \vee \bar{r}$	$p \wedge (q \vee \bar{r})$
F	F	F	T	F
F	F	T	F	F
F	T	F	T	F
F	T	T	T	F
T	F	F	T	T
T	F	T	F	F
T	T	F	T	T
T	T	T	T	T

$p \to q$

"p implies q"

"if p, then q"

p	q	$p \to q$	$\overline{p} \vee q$
F	F	T	T
F	T	T	T
T	F	F	F
T	T	T	T

$(p \to q) \leftrightarrow (\overline{p} \vee q)$ Implication Identity

One way to show that 2 logical expressions are equivalent is via truth table:

1. $p \wedge (p \vee q)$ 2. p

p	q	$p \vee q$	$p \wedge (p \vee q)$
F	F	F	F
F	T	T	F
T	F	T	T
T	T	T	T

identical columns

We can use this method to prove each of the Laws of Logic.

Simplifying Boolean expressions via the laws of logic and showing the equivalence of 2 expressions via laws of logic.

1. $(p \to r) \wedge (q \to r)$ 2. $(p \vee q) \to r$

1. $(p \to r) \wedge (q \to r)$	Given
2. $(\overline{p} \vee r) \wedge (\overline{q} \vee r)$	Implication Identity $\times 2$
3. $(r \vee \overline{p}) \wedge (r \vee \overline{q})$	Commutative Law $\times 2$
4. $r \vee (\overline{p} \wedge \overline{q})$	Distributive Law
5. $(\overline{p} \wedge \overline{q}) \vee r$	Commutative Law
6. $\overline{p \vee q} \vee r$	De Morgan's Law
7. $(p \vee q) \to r$	Implication Identity