1 Boolean Algebra

- AB – logical product or conjunction
  - both A and B are true, order does not matter
- A + B – logical sum or disjunction
  - at least one of A or B is true, order does not matter
- if A or B is true iff the other is true, they both have the same truth value
  - does not matter how it is established that they have the same truth value
  - leads to the most primative axiom of plausible reasoning: two propositions with the same truth value are equally plausible

1.1 Trivial identities of Boolean algebra

Idempotence: $AA = A$ $A + A = A$

Commutativity: $AB = BA$ $A + B = B + A$

Associativity: $A(BC) = B(AC) = ABC$ $A + (B + C) = (A + B) + C = A + B + C$

Distributivity: $A(B + C) = AB + BC$ $A + (BC) = (A + B)(A + C)$

Duality: If $C + AB$, then $\bar{C} = \bar{A} + \bar{B}$ If $D = A + B$, then $\bar{D} = \bar{A}\bar{B}$

- these trivial identities can be used to prove more important relations
- $A \Rightarrow B$
  - A implies B, does not assert that either A or B is true
  - same thing as $A\bar{B}$ is false
  - if A is false, it says nothing about B, and vice versa
  - means A and AB have the same truth value
- the three operations, conjunction, disjunction, and negation (the bar over the letter) are adequate to generate all logic functions of a single proposition
- Conditional probability: $A|B$
  - the conditional probabiltiy that A is true given that B is true
  - can use all the above identities