# CS360 – Homework #1

## Propositional Logic

**1)** Translate the following Propositional Logic to English sentences.
Let:

- $E$=Liron is eating
- $H$=Liron is hungry

(a) $E \Rightarrow \neg H$

(b) $E \wedge \neg H$

(c) $\neg(H \Rightarrow \neg E)$

**2)** Translate the following English sentences to Propositional Logic.
(Clearly define your atomic propositions.)

(a) It is raining if and only if Liron is sick.

(b) If Liron is sick then it is raining, and vice versa.

(c) It is raining is equivalent to Liron is sick.

(d) Liron is hungry but happy.

(e) Liron either owns a cat or a dog.

**3)** Which of the following propositions are tautologies? Which are contradictions? Why?

(a) Three is a prime number.

(b) It is raining or it is not raining.

(c) It is raining and it is not raining.

**4)** Which of the following propositions are tautologies? Why?

(a) $P$

(b) $P \Rightarrow P$

(c) $(P \Rightarrow P) \Rightarrow P$

(d) $P \Rightarrow (P \Rightarrow P)$

**5)** Which of the two following propositions are equivalent in the sense that one can always be substituted for the other one in any proposition without changing its truth value? Why?

(a) first proposition:$P \Rightarrow Q$ second proposition: $\neg P \vee Q$

(b) first proposition: $\neg P$ second proposition: $P \Rightarrow False$

(c) first proposition: $\neg P$ second proposition: $False \Rightarrow P$

(d) first proposition: $\neg P$ second proposition: $\neg P \vee Q$