**7.8 – We have defined four binary logical connectives**

**a.** **Are there any others that might be useful?**

Another binary logic would be XOR. It creates a new binary string based off an OR of each of the binary numbers of two numbers.

**b.** **How many binary connectives can there be?**

There can be 16 connectives. The inputs can be TT, TF, FT, and FF. The outputs can be T or F. This means that 24 outputs are possible.

**c.** **Why are some of them not very useful?**

If we were to say “P and not(Q)”, we could just as easily say “P and not Q” to save time.

**8.2 – Consider a knowledge base containing just two sentences: *P(a)* and *P(b)*. Does this knowledge base entail ? Explain your answer in terms of models.**

a. It would not entail for all X, P(x).

b. Given a domain of {P, Q, R}, if a -> {P} and b->{Q}, then even though R is input, the function is not true for it, and therefore the function is not true for all x.

**9.1 – Prove that Universal Instantiation is sound and that Existential Instantiation produces an inferentially equivalent knowledge base.**

If we assume that Universal Instantiation can infer any sentence, then we could extend that to cover any sentence produced by Existential Instantiation. Thus, while the two are not necessarily equivalent, they both can be satisfiable at the same input.