

Discrete mathematics I. – Problem set 0

Problem sessions in the week of September 23, 2013

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Prove the following.

1.  $\sum_{k=0}^n k^2 = 1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ .

2.  $\sum_{k=0}^n \frac{1}{2^k} = 2 - 2^{-n}$ .

3. If  $2|n$  then  $4|n^2$ .

Decide whether the following formulas are tautologies using the truth tables:

4.  $p \Rightarrow (q \Rightarrow p)$

5.  $(p \Rightarrow q) \Rightarrow p$

6.  $(p \Rightarrow q) \Leftrightarrow \neg(p \wedge \neg q)$

7.  $\neg(p \wedge q) \Leftrightarrow (\neg p \vee \neg q)$

What is the meaning of some of these tautologies in everyday life? Give an illustrative example.