Mandatory excercises for week 38

Mads Petersen
S17

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1

Let S = {a,♣,1} and T = {1,2}
a)
Determine $S \cap T, S \cup T, S \setminus T$, and $T \setminus S$
$S \cap T = \{1\}$ because 1 is the only element that is both in S and T.
$S \cup T = \{a, ♣, 1, 2\}$ because it is the union of both sets.
$S \setminus T = \{a, ♣\}$ because it is the set S minus the set T, and the remainder is this.
$T \setminus S = \{2\}$ because it is the set T minus the set S.
b)
$S \times S = \{(a, a), (a, ♣)\, (a, 1), (♣, a), (♣, ♣), (♣, 1), (1, a), (1, ♣), (1, 1)\}$ because it is the cartesian product of S and S
$S \times T = \{(a, 1), (a, 2), (♣, 1), (♣, 2), (1, 1), (1, 2)\}$ it is the cartesian product of S and T ordered in such a way that $S \times T = \{(s, t)\}$
c)
The empty set $\emptyset$ is not an element because it is a set. (π,4) is an element because the cartesian product in this case would contain, in the first posistion, all real numbers between 0 and 10, not including 10, and π is a real number between 1 and 10, and in the second posistion all the natural numbers are represented, and 4 is a natural number. ($\sqrt{2}$,10) is a member for the same reasons as (π,4). 0 is not an odered pair and is therefore not an element of S. (4,π) is not an element because π is not a natural number and {1,2} is not an element because it is a set, but it is a subset of S.

2

$p(x) = x^n + x^{n-1} + x^{n-2} + ... + x^2 + x + 1$, $q(x) = x - 1$

a)

$p \cdot q = (x^{n+1} - x^n) + (x^n - x^{n-1}) + ... + (x^2 - x) + (x - 1) <=> \underline{x^{n+1} - 1}$ and the degree of $p \cdot q$ is equal to n+1 and the coefficient of a_n=1 and a_0=-1

b)

p(x) with n = 3 is : $p(x) = x^3 + x^2 + x + 1$

$p \circ q = \underline{(x-1)^3 + (x-1)^2 + x - 1}$ which has a degree of 3

and $a_3 = 1, a_2 = -2, a_1 = 2, a_0 = -1$

$q \circ p = \underline{x^3 + x^2 + x}$ with degree of 3 and $a_3 = 1, a_2 = 1, a_1 = 1, a_0 = 0$