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10/22/2019

Homework 6: vectors

1. Find the dot product of the following:

a) $u = [3\ 4\ 5\ 1]$, $v = [10\ {-12}\ 5\ 10] \in \mathbb{R}$

$u \cdot v = [3\ 4\ 5\ 1] \cdot [10\ {-12}\ 5\ 10]$

$u \cdot v = 3 \cdot 10 + 4 \cdot {-12} + 5 \cdot 5 + 1 \cdot 10$

$u \cdot v = 30 + (-48) + 25 + 10 = 17$

b) $u = [1\ 1\ 1\ 0\ 0\ 1]$, $v = [1\ 0\ 1\ 0\ 1\ 1] \in GF(2)$

$u \cdot v = [111001] \cdot [101011]$

$u \cdot v = 1 \cdot 1 + 1 \cdot 0 + 1 \cdot 1 + 0 \cdot 0 + 0 \cdot 1 + 1 \cdot 1$

$u \cdot v = 1 + 0 + 1 + 0 + 0 + 1$

$u \cdot v = 1 + 1 + 1$

$u \cdot v = 0 + 1$

$u \cdot v = 1$

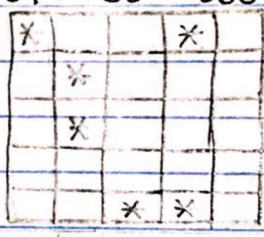
c) $u = [-10\ 0\ 5\ 6\ 12\ 8]$, $v = [1\ {-100}\ 50\ 6\ 7\ 25] \in \mathbb{R}$

$u \cdot v = [-10\ 0\ 5\ 6\ 12\ 8] \cdot [1\ {-100}\ 50\ 6\ 7\ 25]$

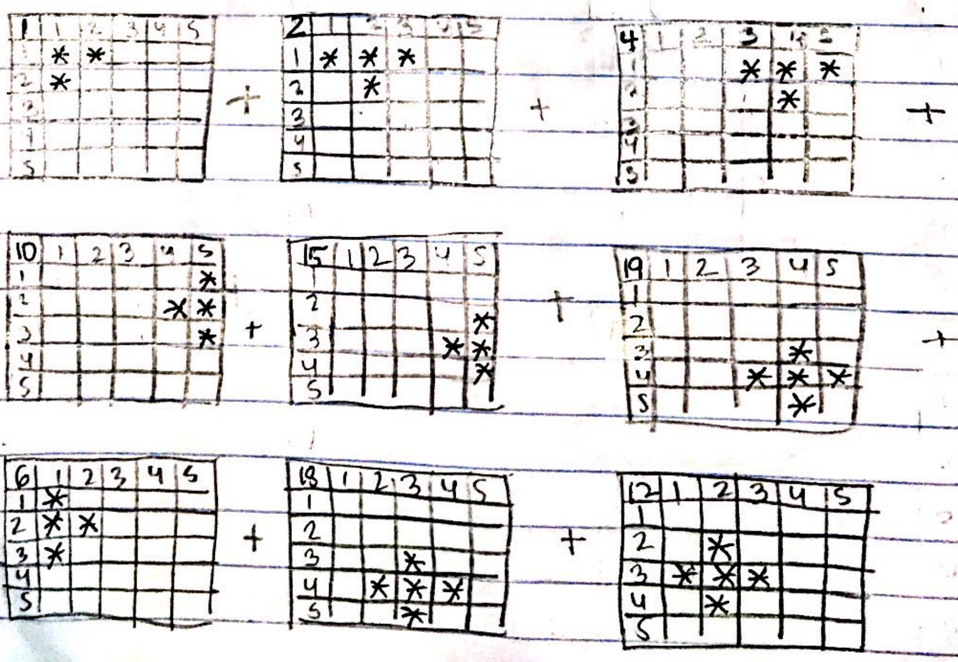
$u \cdot v = -10 \cdot 1 + 0 \cdot {-100} + 5 \cdot 50 + 6 \cdot 6 + 12 \cdot 7 + 8 \cdot 25$

$u \cdot v = -10 + 0 + 250 + 36 + 84 + 200 = 560$

2 Solve the lights out problem for:



$1 + 2 + 4 + 6 + 10 + 12 + 15 + 18 + 19$



Scanned with CamScanner

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Homework 6: Vectors 10/22/2019

3. Show that for 2-vectors in GF(2) if the dot product $(u \cdot v) = 0$ and if $u = (u_1, u_2)$ and $v = (v_1, v_2)$ then $u_1 \cdot u_2 \cdot v_1 \cdot v_2 = 0$

$u \cdot v = 0$

$u = ([1,1],[1,1])$

$v = ([1,1],[1,1])$

$[u_1, u_2] \cdot [v_1, v_2] = 0$

$u_1 \cdot v_1 + u_2 \cdot v_2 = 0$

$[1,1] \cdot [1,1] + [1,1] \cdot [1,1] = 0$

$1 \cdot 1 + 1 \cdot 1 + 1 \cdot 1 + 1 \cdot 1 = 0$

$1 + 1 + 1 + 1 = 0$

$0 + 0 = 0$

$0 = 0$

$u_1 \cdot u_2 \cdot v_1 \cdot v_2 = 0$

$[1,1] \cdot [1,1] \cdot [1,1] \cdot [1,1] = 0$

$1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 0$

$1 \cdot 1 \cdot 1 \cdot 1 = 0$

$1 \cdot 1 = 0$

$1 \neq 0$

The dot product $(u \cdot v) = 0 \rightarrow$ True

$u_1 \cdot u_2 \cdot v_1 \cdot v_2 = 0 \rightarrow$ False

$\therefore$ This proof is not correct