

Homework 3

addition

1.) $x + y = 1$

$$x \rightarrow (a+b)$$

$$y \rightarrow (c+d)$$

$$(a+b) + (c+d) = 1$$

$$1 + 1 = 1$$

$$2 \neq 1$$

hence does not hold.

$$x(a,b)$$

$$(xa, xb)$$

$$x(a+b) = 1$$

$$x(1) = 1$$

$$x \neq 1$$

hence does not hold

2.) $(a,b) + (c,d) \rightarrow (a+c, b+d)$

if $a, b, c, d > 0$ or $a+c > 0$ & $b+d > 0$
then holds under vector addition

$$x(a,b) \rightarrow (xa, xb)$$

if $x > 0$ would be $xa > 0$ & $xb > 0$ if
 $x < 0$ then it will not hold under scalar
multiplication

3.) for a vector space

Scalar multiplication

$$x(a,b) \rightarrow (xa, xb)$$

$$(1+2)(x,y) \rightarrow (1+2x, y)$$

RHS

$$1 \cdot (x,y) + 2(x,y) = (1x, y) + (2x, y)$$

$$= (1x + 2x, y+y)$$

$y + y \neq y$ hence violates

$$4.) \quad x + y + z = 0$$

$$x \rightarrow a + b$$

$$y \rightarrow c + d$$

$$z \rightarrow e + f$$

$$(a+b) + (c+d) + (e+f) = 0$$

$$0 + 0 + 0 = 0$$

holds

$$\text{Let } X = (x, y, z) \in X \rightarrow x + y + z = 0$$

$$CX = (cx, cy, cz)$$

$$cx + cy + cz = c(x + y + z)$$

$$cx + cy + cz = 0$$

$$c(0) = 0$$

$CX \in U$ holds under multiplication