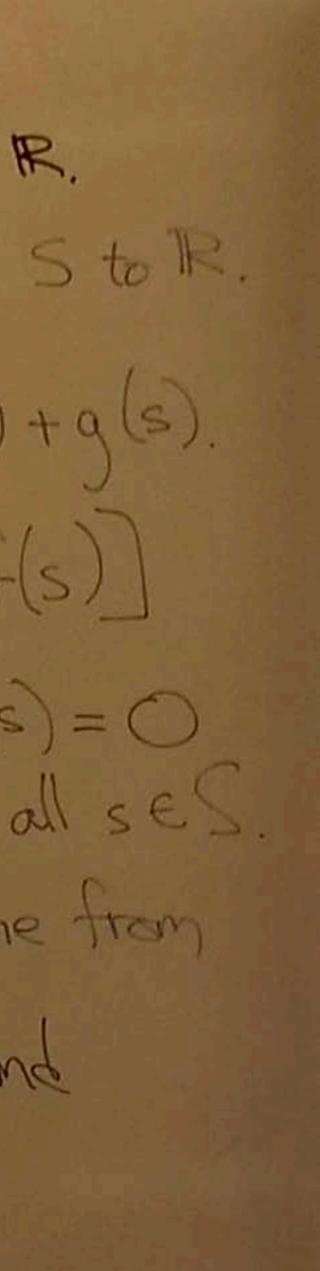
amy pang. github.io/3407 black - old Hue - new 36.1 Basic properties of vector spaces A vector space over IF is a set with addition and scalar multiplication satisfying 10 axioms (see reference sheet) usual Exs: A list of a numbers: addition and scalar  $\Theta R^{n} = \{T_{x_{1}}^{n}\} \times \{x_{n}, x_{n} \in R\}$ multiplication [ Lxn]

sequences  $\{(x_1, x_2, \dots) | x_i \in \mathbb{R}\}$ Ex 6.1-11 componentwise addition and scalar multiplication. •  $(x_1, x_2, \dots) + (x'_1, x'_2, \dots)$  $=(x_1+x_1', x_2+x_2', ...)$ •  $c(x_1, x_2, \dots) = (cx_1, cx_2, \dots)$ Check V4:  $\vec{O} = (O, O, ...)$ satisfies  $(x_1, x_2, ...) + (0, 0, ....) = (x_1, x_2, ...)$ Ex 6.1-12 convergent sequences (i.e. lim x, exists) To check V4 - need to show (0,0,...) is convergent V  $(x_1 + x_1', x_2 + x_2', \cdots)$  is convergent see Functional Analysis. (x, x2,...), (x, , x2,...), (x, , x2,...)

(3) Mm,n (R), mxn matrices with entries in R. (4) Functions from any non-empty domain S to IR. f + g defined by (f + g)(s) = f(s) + g(s). (cf)(s) = c[f(s)]e.g.  $V4: \vec{O}$  is the zero function:  $\vec{O}(s) = O$ for all sES. Many interesting vector spaces come from choosing particular domains S and particular "types" of functions



(5)  $S = [0, 1] = \{x \mid 0 \le x \le 1\}$  $C^{\circ}([0, 1]) = \{f: [0, 1] \rightarrow \mathbb{R} \text{ that are} \}$ G S = RR[z] = {f:R->R that are polynomials} (8) The variable is x. (8)  $P_n(R) = \{f: R \rightarrow R \text{ that are polynomials}\}$ of degree < n)  $= \left| a_0 + a_1 x + \dots + a_{n-1} x^{n-1} \right| a_i \in \mathbb{R} \right|$ 

