

If $f(x) \in K[x]$, K a field,
then in video I claimed

$$f(a) = 0 \iff (x-a) \mid f(x)$$

i.e. $f(x) = q(x)(x-a)$.

Start with Exercise 2-11
to justify this.

(Note: one way when $K = \mathbb{R}$ is to write down
the Taylor expansion of $f(x)$ at $x=a$).

$$n=2$$

$$\begin{array}{r} c_2 x + (c_1 + ac_2) \\ x - a \overline{) c_2 x^2 + c_1 x + c_0} \\ \underline{-(c_2 x^2 - ac_2 x)} \\ (c_1 + ac_2)x + c_0 \\ \underline{-(c_1 + ac_2)x + (c_1 + ac_2)a} \\ c_0 + c_1 a + c_2 a^2 \\ \hline \text{remainder} = f(a). \end{array}$$

2 - (2) Describe an algorithm to find the prime factorization of any polynomial in $\mathbb{F}_p[x]$.

Prime in $K[x]$ = a monic polynomial $a(x)$

such that if

$b(x) | a(x)$ then

$\deg b(x) = \deg a(x)$

or $\deg b(x) = 0$.

Any nonzero polynomial $f(x)$

has a unique prime factorization

$$f(x) = c a_1(x)^{n_1} a_2(x)^{n_2} \dots a_k(x)^{n_k} \quad a_i(x)$$

$(c \in K$

are prime.

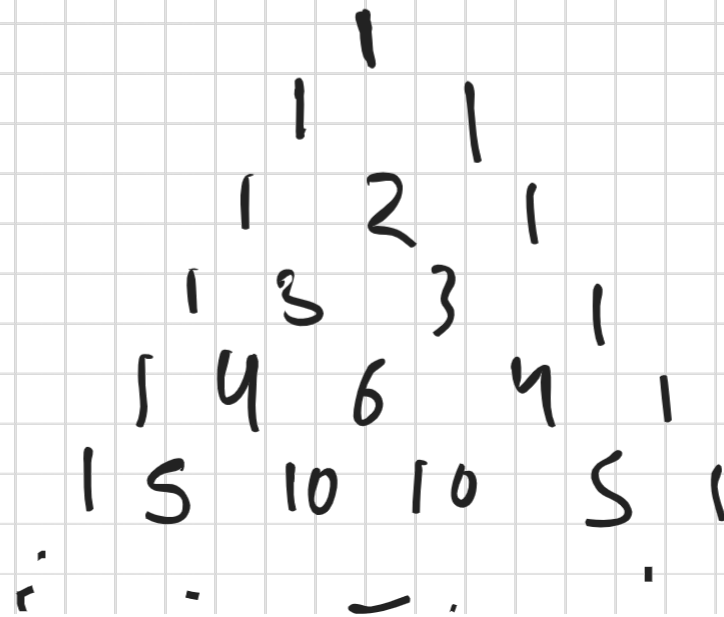
$n_i > 0$

$\leftarrow b(x) =$
 $\leftarrow b(x)$
 if b
 non

2. (2) asky to describe an algorithm for finding
prime factorization,

Exercise 1: Pascal's triangle ;
binomial coefficients

Pascal's triangle



$$\binom{n}{k}$$

means the number of
ways to choose
k flavors of ice cream
from a menu with n flavors