Say height of $G \geq h$. If $g'(0)$ is a unit, say height $G = h$.

Suppose ht $G = h$

$$[p](x) = u \cdot x^{p^h} + \cdots$$

$$= u \cdot x^{p^h} \underbrace{(1 + O(x))}_{\text{unit in } R[[x]]}$$

so $R[[x]]/[p](x)$ free R-mod. rk. h.

Start with G over general ring R.

$v_0 = p$

G over $R/(p)$: $[p](x) = g(x^p) = v_1 x^p + \cdots$

$v_1 \in R/(p)$.

G over $R/(p, v_1)$: $[p](x) = v_2 x^{p^2} + \cdots$

$\vdots$

$v_n \in R/(p, v_1, \ldots, v_{n-1})$: $[p](x) = v_n x^{p^n} + \cdots$

Rem The ideal gen. by $v_n \in R/(p, v_1, \ldots, v_{n-1})$ is independent of x, i.e. an invariant of the formal group.

pf $y = \lambda x + \cdots$ $\quad v_n \longmapsto \lambda^{p^n-1} v_n$ .. //
$\lambda \in R^*$

Spectra and homology theories

Def A spectrum is a collection of spaces

$$E = \{E_n\}_{n \in \mathbb{Z}}$$

together with homeomorphisms

$$E_n \underset{\approx}{\xrightarrow{t_n}} \Omega E_{n+1}.$$

A map of spectra is

$$E = \{E_n, t_n^E\} \xrightarrow{f} F = \{F_n, t_n^F\}$$

$$\begin{tikzcd} E_n \arrow[r, "f_n"] \arrow[d, "t_n^E", "\approx"'] & F_n \arrow[d, "t_n^F", "\approx"'] \\ \Omega E_{n+1} \arrow[r, "\Omega f_{n+1}"] & \Omega F_{n+1} \end{tikzcd}$$