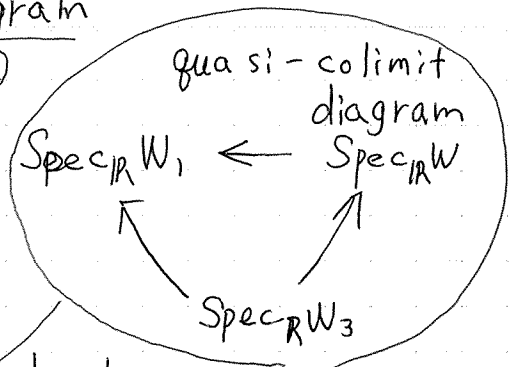
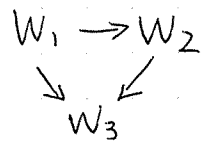


1/1(火) 第5回数理科学ⅢB

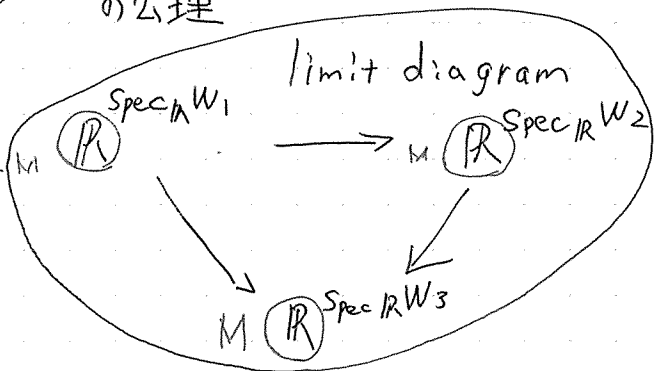
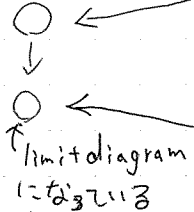
quasi-colimit diagram

limit diagram

Weil代数



任意の quasi-colimit diagram
Kock-Lawvere の公理



micro linear space M

主なる研究対象

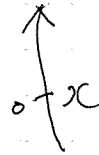
$$M \ni x$$

$T_x M$ 点 x の接空間

$$t: D \rightarrow M \quad t(0) = x$$

接ベクトル

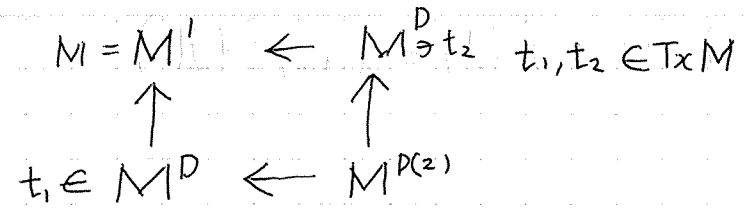
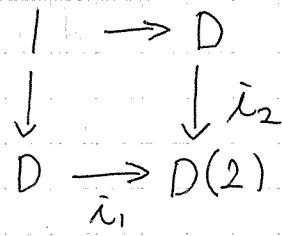
$$T_x M = \{t: D \rightarrow M : t(0) = x\}$$



スカラー倍
足し算

$$(\alpha t)(d) = t(\alpha d)$$

$$I = \{0\}$$



$$\exists! \quad l_{(t_1, t_2)} = D(2) \rightarrow M$$

$$0(d) = x$$

$$l_{(t_1, t_2)}(d, 0) = t_1(d)$$

$$l_{(t_1, t_2)}(0, d) = t_2(d)$$

$$(t_1 + t_2)(d) = l_{(t_1, t_2)}(d, d)$$

線形空間
 $d \in D, \alpha \in \mathbb{R} \Rightarrow \alpha d \in D$

$$(1) \quad (t_1 + t_2) + t_3 = t_1 + (t_2 + t_3) \quad \boxed{l_{(d, d)}} = l_{(t_1, t_2)}(d, d) \xrightarrow{l_{(t_1, t_2)}(d, d)} l_{(t_1, t_2)}(d, d)$$

$$(2) \quad t_1 + t_2 = t_2 + t_1 \quad (5) \quad d(t_1 + t_2)(d) = \cancel{d(t_1 + t_2)(d)} (t_1 + t_2)(d)$$

$$(3) \quad t + 0 = 0 + t = t \quad = l_{(t_1, t_2)}(d, d)$$

$$(4) \quad 1t = t \quad (d_1, d_2) \rightarrow l_{(t_1, t_2)}(d, d)$$

$$(5) \quad \alpha(t_1 + t_2) = \alpha t_1 + \alpha t_2 \quad d_1 d_2 = 0$$

$$(6) \quad \alpha(\beta t) = \alpha\beta t \quad D(2)(d_1, d_2) \mapsto t(d, d + \beta d_2) \in M$$

$$(7) \quad (\alpha + \beta)t = \alpha t + \beta t \quad t(d, d) = (\alpha t)(d)$$

確認

$$(4) \quad (1t)d = t(1d) = t(d) \quad t(\beta d) = (\beta t)(d)$$

$$(6) \quad \alpha(\beta t)(d) = (\beta t)(\alpha d) = t(\beta \alpha d) = t((\alpha\beta)d) = (\alpha\beta)(t)(d)$$

$$(7) \quad ((\alpha + \beta)t)(d) = (\alpha t + \beta t)(d) = l_{(\alpha t, \beta t)}(d, d) = t((\alpha + \beta)d)$$

$$(d_1, d_2) \mapsto t(d_1)$$

$$(3) \quad (t+0)(d) = l_{(t,0)}(d,d) \quad (d_1, d_2) \mapsto t(d_1)$$

$$(d, 0) \quad \downarrow \quad t(d)$$

$$(0, d) \quad \leftarrow \quad t(0) = x$$

$$(2) \quad (t_1 + t_2)(d) = l_{(t_1, t_2)}(d, d)$$

$$(b) \quad t = (0, b) \quad (d_1, d_2) \mapsto l_{(t_2, t_1)}(d_2, d_1) = (b)$$

$$(b) \quad t = (b, 0) \quad (d, 0) \mapsto l_{(t_2, t_1)}(d, d)$$

$$(1) \quad ((t_1 + t_2) + t_3)(d)$$

$$t_1, t_2, t_3 \in T_x M$$

$$D(3) = \{(d_1, d_2, d_3) \in D \times D \times D \mid d_1 d_2 = d_2 d_3 = d_1 d_3 = 0\}$$

$$l_{(t_1, t_2, t_3)} = D(3) \rightarrow M$$

$$l_{(t_1, t_2, t_3)}(d, 0, 0) = t_1(d)$$

$$l_{(t_1, t_2, t_3)}(0, d, 0) = t_2(d)$$

$$l_{(t_1, t_2, t_3)}(0, 0, d) = t_3(d)$$

$$l_{(t_1, t_2)}$$

$$t_1 + t_2$$

$$D(2) \ni (d_1, d_2) \mapsto l_{(t_1, t_2, t_3)}(d_1, d_2, 0)$$

$$D(2) \ni (d_1, d_2) \mapsto l_{(t_1, t_2, t_3)}(d_1, d_2, d_2) \quad (t_1 + t_2)(d) = l_{(t_1, t_2, t_3)}(d, d, 0)$$

$$l_{(t_1, t_2, t_3)}(d, d, 0) = (t_1 + t_2)(d)$$

$$((t_1 + t_2) + t_3)(d) = l_{(t_1, t_2, t_3)}(d, d, d)$$

$$(d_1, d_2) \mapsto l_{(t_1, t_2, t_3)}(0, d_1, d_2)$$

$$(t_2 + t_3)(d) = l_{(t_1, t_2, t_3)}(0, d, d)$$

$$t_1 + (t_2 + t_3)$$

$$D(2) \ni (d_1, d_2) \mapsto l_{(t_1, t_2, t_3)}(d_1, d_2, d_2)$$

