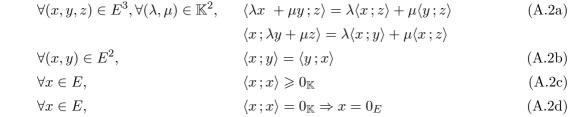
$$\forall x \in V, \qquad ||x|| = 0_{\mathbb{K}} \Rightarrow x = 0_{V}$$

$$\forall x \in V, \forall \lambda \in \mathbb{K}, \qquad ||\lambda x|| = |\lambda| ||x||$$

$$\forall (x, y) \in V^{2}, \qquad ||x + y|| \leq ||x|| + ||y||$$
(A.1a)
$$(A.1b)$$



$$\forall x \in E, \quad \|x\| = \sqrt{\langle x; x \rangle} \tag{A.3}$$

$$\lim_{h \to 0} \frac{f(u_0 + h) - f(u_0) - \mathbf{D}f(u_0) \cdot h}{\|h\|} = 0 \tag{A.4a}$$

$$f(u_0 + h) = f(u_0) + \mathbf{D}f(u_0) \cdot h + o(h)$$
 , $\lim_{h \to 0} \frac{o(h)}{\|h\|} = 0$ (A.4b)

$$f'(u_0) = \mathbf{D}f(u_0) \tag{A.5}$$

$$\frac{d}{d\lambda}f(u_0 + \lambda h)\Big|_{\lambda=0} = \lim_{\lambda \to 0} \frac{f(u_0 + \lambda h) - f(u_0)}{\lambda}$$
(A.6)

$$\forall h \in \mathcal{U}, \quad \lim_{\lambda \to 0} \frac{f(u_0 + \lambda h) - f(u_0)}{\lambda} = \frac{d}{d\lambda} f(u_0 + \lambda h) \Big|_{\lambda = 0} = \mathbf{D} f(u_0) \cdot h \tag{A.7a}$$

$$\forall h \in \mathcal{U}, \quad f(u + \lambda h) = f(u) + \lambda \mathbf{D} f(u_0) \cdot h + o(\lambda) \quad , \quad \lim_{\lambda \to 0} \frac{o(\lambda)}{\lambda} = 0$$
 (A.7b)

$$f'(u_0) = \mathbf{D}f(u_0) \tag{A.8}$$

$$D(f+g)(u) = Df(u) + Dg(u)$$

$$D(f \circ h)(u) = Dh(f(u)) \circ Df(u) = Dh(f(u)) \cdot Df(u)$$
(A.9)

$$f_1: \mathcal{B}_{V_1} \longrightarrow \mathcal{B}_W$$
 $u_1 \longmapsto f(u_1, u_{02})$, $f_2: \mathcal{B}_{V_2} \longrightarrow \mathcal{B}_W$ $u_2 \longmapsto f(u_{01}, u_2)$ (A.11)

$$D_{1}f(u) \cdot h_{1} = Df(u) \cdot (h_{1}, 0)$$

$$D_{2}f(u) \cdot h_{2} = Df(u) \cdot (0, h_{2})$$

$$Df(u) \cdot (h_{1}, h_{2}) = D_{1}f(u) \cdot h_{1} + D_{2}f(u) \cdot h_{2}$$
(A.12)
$$(A.13)$$

$$\forall h \in \mathcal{H}, \quad \langle (grad \ F)(x), h \rangle = \mathbf{D}F(x) \cdot h$$
 (A.15)

 $m{F}_{x+h} = m{F}_x + (grad\ F)_x^T H + m{o}(H)$, $grad\ F_x = \begin{bmatrix} rac{\partial F}{\partial x_1} \\ \vdots \\ rac{\partial F}{\partial x_r} \end{bmatrix} \in \mathbb{R}^n$

$$\forall h \in \mathcal{L}^2, \quad \mathbf{D}F(x) \cdot h = \langle (grad \ F)(x) , h \rangle = \int (grad \ F)h$$
 (A.1)

 $\mathbf{D}f(x) = \mathbf{J}_{x} = \frac{df}{dx} = \begin{bmatrix} \frac{\partial f}{\partial x_{1}} & \cdots & \frac{\partial f}{\partial x_{n}} \end{bmatrix} = \begin{bmatrix} \frac{\partial f_{1}}{\partial x_{1}} & \cdots & \frac{\partial f_{1}}{\partial x_{n}} \\ \vdots & \ddots & \vdots \\ \frac{\partial f_{m}}{\partial x_{1}} & \cdots & \frac{\partial f_{m}}{\partial x_{n}} \end{bmatrix} \in \mathcal{M}_{m,n}(\mathbb{R})$ (A.18)

$$\mathbf{F}_{x+h} = \mathbf{F}_x + \mathbf{J}_x H + \mathbf{o}(H) \tag{A.19}$$

$$\mathbf{D}F(x) = \mathbf{J}_x = \frac{dF}{dx} = \begin{bmatrix} \frac{\partial F}{\partial x_1} & \cdots & \frac{\partial F}{\partial x_n} \end{bmatrix} = \nabla F^T$$

(A.20)

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. . .

 $\frac{\partial F_1^2}{\partial x_2^2}$

 $\overline{\partial x_1 \partial x_n}$

 $\overline{\partial x_2 \partial x_n}$

 $\in \mathcal{M}_{n,n}(\mathbb{R})$

 $\frac{\partial x_1^2}{\partial F_1^2}$

 $\partial x_2 \partial x_1$

 $\partial x_n \partial x_1$

 $\mathbf{D}^2 F(x) = \mathbf{H}_x$

 \overline{dx}

$$\boldsymbol{F}_{x+h} = \boldsymbol{F}_x + \boldsymbol{J}_x H + \frac{1}{2} H^T \boldsymbol{H}_x H + \boldsymbol{o}(H)$$
(A.22)