Table 1 Topology cheet sheet 1

	topological space $(X,\ \mathfrak{O})$	metric space $(X,\ d)$
内部 (内点)	$M^i \quad (M \subset X)$	$\{x \mid \exists\epsilon > 0,\ N(x;\epsilon) \subset M\}$
中心 c の開球	-	$N(c;\epsilon) = \{x \mid d(x,\ c) < \epsilon\}$
閉包 (触点)	$\overline{M} \quad (M \subset X)$	$\{x \mid \forall\epsilon > 0,\ N(x;\epsilon) \cap M \neq \phi\}$ $\Leftrightarrow \{x \mid \exists(x_n)_{n\in\mathbb{N}} \in M\ s.t.\ \lim_{n\to\infty} x_n = x\}$
境界 (境界点)	$M^i \backslash \overline{M}$	$\{x \mid \forall\epsilon > 0,\ (N(x;\epsilon) \cap M \neq \phi) \wedge (N(x;\epsilon) \cap M^c \neq \phi)\}$
導集合 (集積点)	$M^a = \{x \mid x \in \overline{M - \{x\}}\}$	$\{x \mid \forall\epsilon > 0,\ N(x;\epsilon) \cap (M - \{x\}) \neq \phi\}$
孤立点集合 (孤立点)	$M \backslash M^a$	$\{x \mid \exists\epsilon > 0,\ N(x;\epsilon) \cap M = \{x\}\}$
基底 $\mathfrak{B}$: open sets	$\forall O \in \mathfrak{O},\ O = \cup_{\lambda\in\Lambda} B_\lambda,\ B_\lambda \in \mathfrak{B}$	
近傍系 $V(x)$	$V(x) = \{V \mid x \in V^i\}$	
基本近傍系 $V^*(x)$	$\exists V \in V^*(x)\ s.t.\ V^* \subset V,\ \forall V \in V(x)$	
第二可算公理	$\lvert\mathfrak{B}\rvert \leq \aleph_0$	
可分空間	$\exists M \subset X\ s.t.\ \lvert M\rvert \leq \aleph_0 \wedge \overline{M} = X$	
第一可算公理	$\lvert V^*(x)\rvert \leq \aleph_0$	
連続写像 $f : X \mapsto Y$	$\forall O \in \mathfrak{O},\ f^{-1}(O) \in \mathfrak{O}$	$\forall\epsilon > 0,\ \exists\delta > 0\ s.t.\ \forall a \in X,\ d_X(x,a) < \delta \Rightarrow d_Y(f(x), f(a)) < \epsilon$
同相写像 $f : X \mapsto Y$	f is bijection.$f,\ f^{-1}$ is a continuous function.	

Table 2　Topology cheet sheet 2

<table>
<tr><th></th><th>topological space $(X,\ \mathfrak{D})$</th><th>metric space $(X,\ d)$</th><th>euclid space $(\mathbb{R}^n,\ d^{(n)})$</th></tr>
<tr><td>連結</td><td>There is no open set $U,\ V$ satisfying:
1. $S \subset U \cup V$
2. $U \cap V = \phi$
3. $U \cap S \neq \phi,\ V \cap S \neq \phi$</td><td></td><td rowspan="2">Let Y be subset of $\mathbb{R}^n$
Y is connected.
$\Leftrightarrow$
Y is path-connected.</td></tr>
<tr><td>弧状連結</td><td>$f : [0,1] \mapsto X,\ f(0) = x,\ f(1) = y$
f is continuous function.</td><td></td></tr>
<tr><td>コンパクト</td><td>Every open cover C of X has a finite subcover.</td><td rowspan="3">Complete and Totally bounded</td><td rowspan="3">Bounded closed set
(Heine-Borel)</td></tr>
<tr><td>点列コンパクト</td><td>Every sequence of points in X has
a convergent subsequence converging to a point in X.</td></tr>
<tr><td>可算コンパクト</td><td>Every countable open cover C of X has a finite subcover.</td></tr>
<tr><td>Lindelöf の性質</td><td>Every open cover C of X has at most countable subcover.</td><td></td><td></td></tr>
<tr><td>局所連結</td><td>$\forall x \in X,\ \forall V \in \mathfrak{D}(x \in V),\ \exists U \subset V\ s.t.$ U is connected.</td><td></td><td></td></tr>
<tr><td>局所コンパクト</td><td>$\forall x \in X, \exists V \in V(x)\ s.t.$ V is compact.</td><td></td><td></td></tr>
<tr><td>有界</td><td>-</td><td>$\forall m \in M,\ \forall x \in X,\ \exists r > 0\ s.t.\ r < \infty,\ d(x,m) < r$</td><td rowspan="2">$\forall k \in \{1,\ 2,\ \cdots,\ n\},\ \exists L_k \in \mathbb{R},\ R_k \in \mathbb{R}$
$X \subset [L_1,\ R_1] \times [L_2,\ R_2] \times \cdots \times [L_n,\ R_n]$</td></tr>
<tr><td>全有界</td><td>-</td><td>$\forall \epsilon > 0,\ \exists C\ s.t.\ \forall U \in C,\ diam(U) < \epsilon,$ C is finite cover.</td></tr>
<tr><td>完備</td><td>-</td><td>Every cauchy sequence of points in X is a convergent sequence.</td><td>$(e.g.)\ \mathbb{R}^n,\ [\ ]$</td></tr>
<tr><td>一様連続写像 $f : X \mapsto Y$</td><td>-</td><td>$\forall \epsilon > 0,\ \exists \delta > 0\ s.t.$
$\forall x,\ a \in X d_X(x,\ a) < \delta \Rightarrow d_Y(f(x),\ f(a)) < \epsilon$</td><td></td></tr>
<tr><td>一様同相写像 $f : X \mapsto Y$</td><td>-</td><td>f is bijection.
$f,\ f^{-1}$ is a uniformly continuous function.</td><td></td></tr>
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