# math

Joey Yu Hsu

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math on bookdown started on 2024/01/28

$\text{script}^{\text{superscript}}{}_{\text{subscript}}$

# Part I

# ordered by discipline

math

# Chapter 1

# test cross-link

2

link to partition

partition [#partition] (3) @ref(#partition)

equivalence class [#equivalence class] (@ref(equivalence class)) @ref(#equivalence class)

[equivalence-class] [#equivalence-class] (2) @ref(#equivalence-class)

[equivalence-class.html] [equivalence-class.html#equivalence-class] (@ref(equivalence-class.html)) @ref(equivalence-class.html#equivalence-class)

equivalence relation [#equivalence relation] (@ref(equivalence relation)) @ref(#equivalence relation)

[equivalence-relation] [#equivalence-relation] (2) @ref(#equivalence-relation)

[equivalence-relation.html] [equivalence-relation.html#equivalence-relation] (@ref(equivalence-relation.html)) @ref(equivalence-relation.html#equivalence-relation)

noun[1]

https://stackoverflow.com/questions/48965247/use-csl-file-for-pdf-output-in-bookdown/49145699#49145699

citation 1[1] citation 2[1]

citation 3[2] citation 4[2]

[1]This is a footnote.

# Chapter 2

# math

# equivalence relation

等價關係 equivalence relation

$R$ is an equivalence relation over $A \times B$

$$\Leftrightarrow \begin{cases} R = \sim = \{\langle x, y\rangle | x \sim y\} \subseteq A \times B & (\mathrm{e})\,\text{equivalence 等價} \\ \vdots & \vdots \end{cases}$$

$$\Leftrightarrow \begin{cases} R = \{\langle x, y\rangle | xRy\} \subseteq A \times B & (R)\,\text{relation} \\ \forall \langle x, y\rangle \in R\,(xRx) & (r)\,\text{reflexive} \\ \forall \langle x, y\rangle \in R\,(xRy \Rightarrow yRx) & (s)\,\text{symmetric} \\ \forall \langle x, y\rangle, \langle y, z\rangle \in R \left( \begin{cases} xRy \\ yRz \end{cases} \Rightarrow xRz \right) & (t)\,\text{transitive} \end{cases} \Leftrightarrow \begin{cases} R = \{\langle x, y\rangle | xRy\} \subseteq A \times B & \text{關係} \\ \forall \langle x, y\rangle \in R\,(\langle x, x\rangle \in R) & \text{自反} \\ \forall \langle x, y\rangle \in R\,(\langle y, x\rangle \in R) & \text{對稱} \\ \forall \langle x, y\rangle, \langle y, z\rangle \in R\,(\langle x, z\rangle \in R) & \text{遞移} \end{cases}$$

# equivalence class

$C$ is an equivalence class of $a$ on $A$

$$\Leftrightarrow [a]_\sim = C = \left\{ x \middle| \begin{cases} a \in A \\ x \in A \\ x \sim a \\ \sim \text{ is an equivalence relation over } A \times A = A^2 \end{cases} \right\} \subseteq A \neq \emptyset$$

$$\Leftrightarrow [a] = [a]_\sim = \left\{ x \middle| \begin{cases} a \in A \\ x \in A \\ x \sim a \\ \sim \text{ is an equivalence relation on } A \end{cases} \right\} \subseteq A \neq \emptyset$$

$$\Rightarrow [a]_\sim = \{x | x \sim a\} \subseteq A \neq \emptyset$$

# Chapter 3

# physics

# partition

$$\{A_i\}_{i\in I} = \{A_i | i \in I\} \text{ is a partition of a set } A$$
$$\Leftrightarrow \begin{cases} \forall i \in I \, (A_i \neq \emptyset) \\ A = \bigcup\limits_{i \in I} A_i \\ \forall i, j \in I \, (i \neq j \Rightarrow A_i \cap A_j = \emptyset) \end{cases}$$

https://proofwiki.org/wiki/Definition:Set_Partition

# Part II

# ordered by date

# Chapter 4

# ordered by date

# partition

$$\{A_i\}_{i\in I} = \{A_i | i \in I\} \text{ is a partition of a set } A$$
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https://proofwiki.org/wiki/Definition:Set_Partition

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$$\Rightarrow [a]_\sim = \{x | x \sim a\} \subseteq A \neq \emptyset$$

# equivalence relation

等價關係 equivalence relation

$R$ is an equivalence relation over $A \times B$

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# Chapter 5

# Python

https://bookdown.org/yihui/rmarkdown/language-engines.html

```
names(knitr::knit_engines$get())
```

```
##  [1] "awk"         "bash"        "coffee"      "gawk"        "groovy"
##  [6] "haskell"     "lein"        "mysql"       "node"        "octave"
## [11] "perl"        "php"         "psql"        "Rscript"     "ruby"
## [16] "sas"         "scala"       "sed"         "sh"          "stata"
## [21] "zsh"         "asis"        "asy"         "block"       "block2"
## [26] "bslib"       "c"           "cat"         "cc"          "comment"
## [31] "css"         "ditaa"       "dot"         "embed"       "eviews"
## [36] "exec"        "fortran"     "fortran95"   "go"          "highlight"
## [41] "js"          "julia"       "python"      "R"           "Rcpp"
## [46] "sass"        "scss"        "sql"         "stan"        "targets"
## [51] "tikz"        "verbatim"    "theorem"     "lemma"       "corollary"
## [56] "proposition" "conjecture"  "definition"  "example"     "exercise"
## [61] "hypothesis"  "proof"       "remark"      "solution"
```

https://rstudio.github.io/reticulate/articles/python_packages.html

```
x = 'hello, python world!'
print(x.split(' '))
```

```
## ['hello,', 'python', 'world!']
```

```
library(reticulate)
```

```
## Warning: package 'reticulate' was built under R version 4.3.2
```

```
virtualenv_python()
```

```
## [1] "C:/Users/RW/Documents/.virtualenvs/r-reticulate/Scripts/python.exe"
```

```
library(reticulate)
conda_list()
```

```
##                        name
## 1                      base
```

```
## 2                        mm
## 3                       mmr
## 4                     monai
## 5                   pytorch
## 6  pytorch_1.12.1_cuda_11.6
## 7              r-reticulate
## 8                   sandbox
## 9           sandbox_py_3.10
## 10                      v51
##                                                                python
## 1                                    C:\\Users\\RW\\anaconda3/python.exe
## 2                      C:\\Users\\RW\\anaconda3\\envs\\mm/python.exe
## 3                     C:\\Users\\RW\\anaconda3\\envs\\mmr/python.exe
## 4                   C:\\Users\\RW\\anaconda3\\envs\\monai/python.exe
## 5                   C:\\Users\\RW\\anaconda3\\envs\\pytorch/python.exe
## 6  C:\\Users\\RW\\anaconda3\\envs\\pytorch_1.12.1_cuda_11.6/python.exe
## 7              C:\\Users\\RW\\anaconda3\\envs\\r-reticulate/python.exe
## 8                   C:\\Users\\RW\\anaconda3\\envs\\sandbox/python.exe
## 9           C:\\Users\\RW\\anaconda3\\envs\\sandbox_py_3.10/python.exe
## 10                      C:\\Users\\RW\\anaconda3\\envs\\v51/python.exe
```

https://rstudio.github.io/reticulate/reference/install_python.html

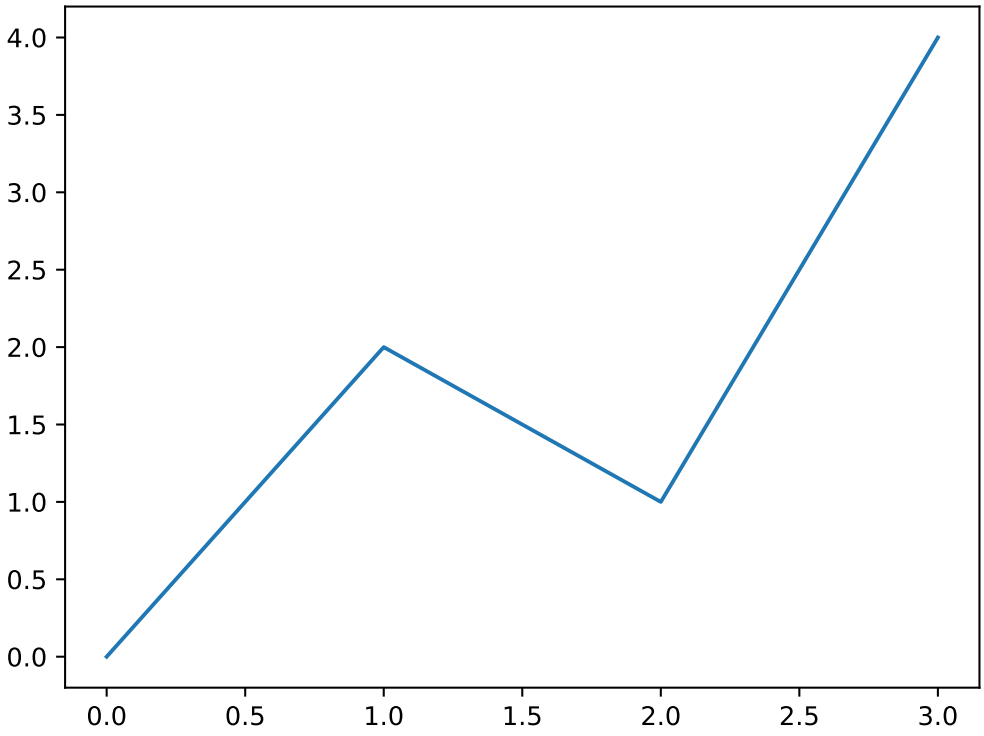
```
library(reticulate)
# version <- "3.9.12"
# install_python(version)

# create a new environment
# virtualenv_create("r-reticulate", version = version)

use_virtualenv("r-reticulate")

# install MatPlotLib
# virtualenv_install("r-reticulate", "matplotlib")

# import MatPlotLib (it will be automatically discovered in "r-reticulate")
matplotlib <- import("matplotlib")
```

```
library(reticulate)
virtualenv_list()
```

```
## [1] "r-reticulate"
```

```
library(reticulate)
use_virtualenv("r-reticulate")
matplotlib <- import("matplotlib")
matplotlib$use("Agg", force = TRUE)
```

```
import matplotlib.pyplot as plt
plt.plot([0, 2, 1, 4])
plt.show()
```


4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0

# references


1. Bookdown books on the web: Downloading and converting to pdf - R Markdown. *Posit Community* (2019).
2. ccjou. 二次型與正定矩陣. (2009).