การเขียนหนังสือภาษาไทยด้วย LaTeX

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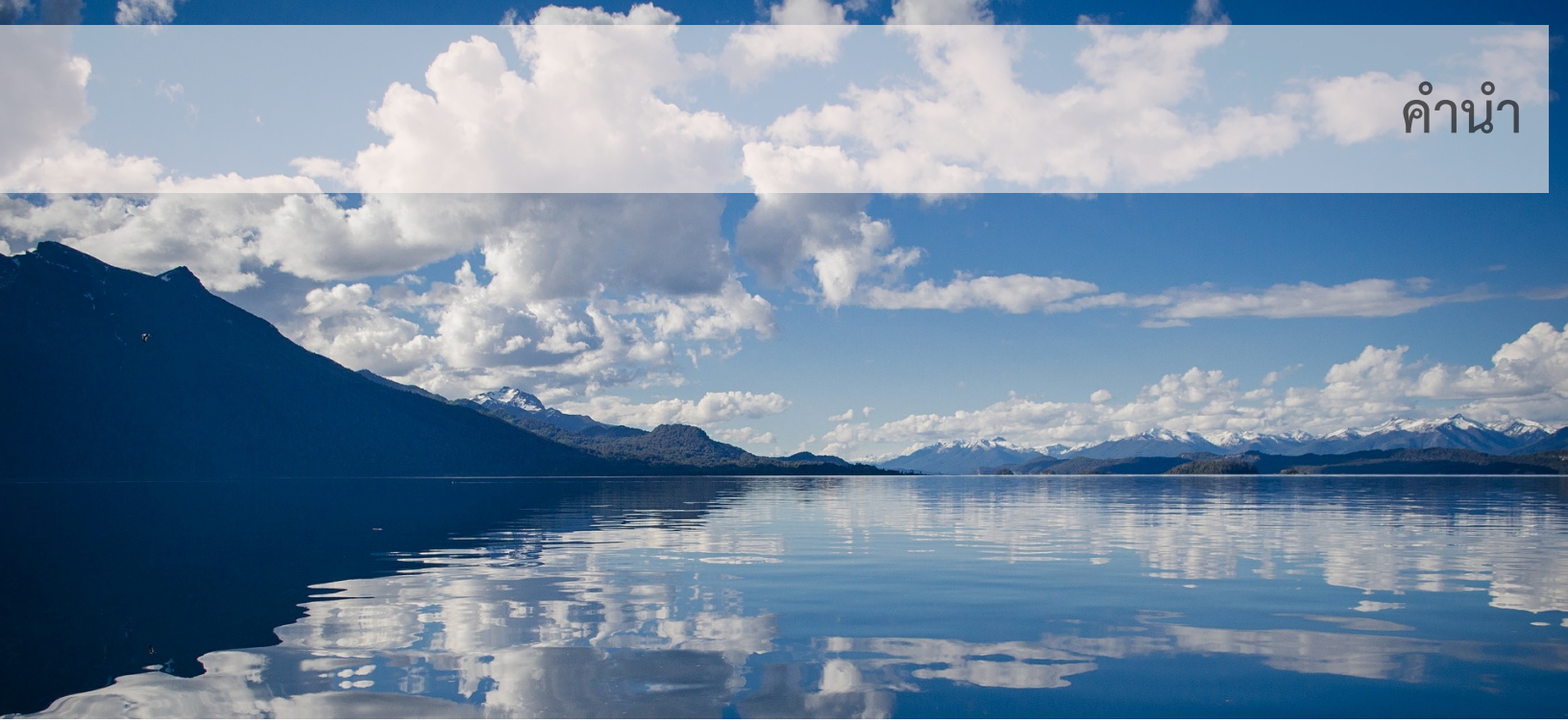
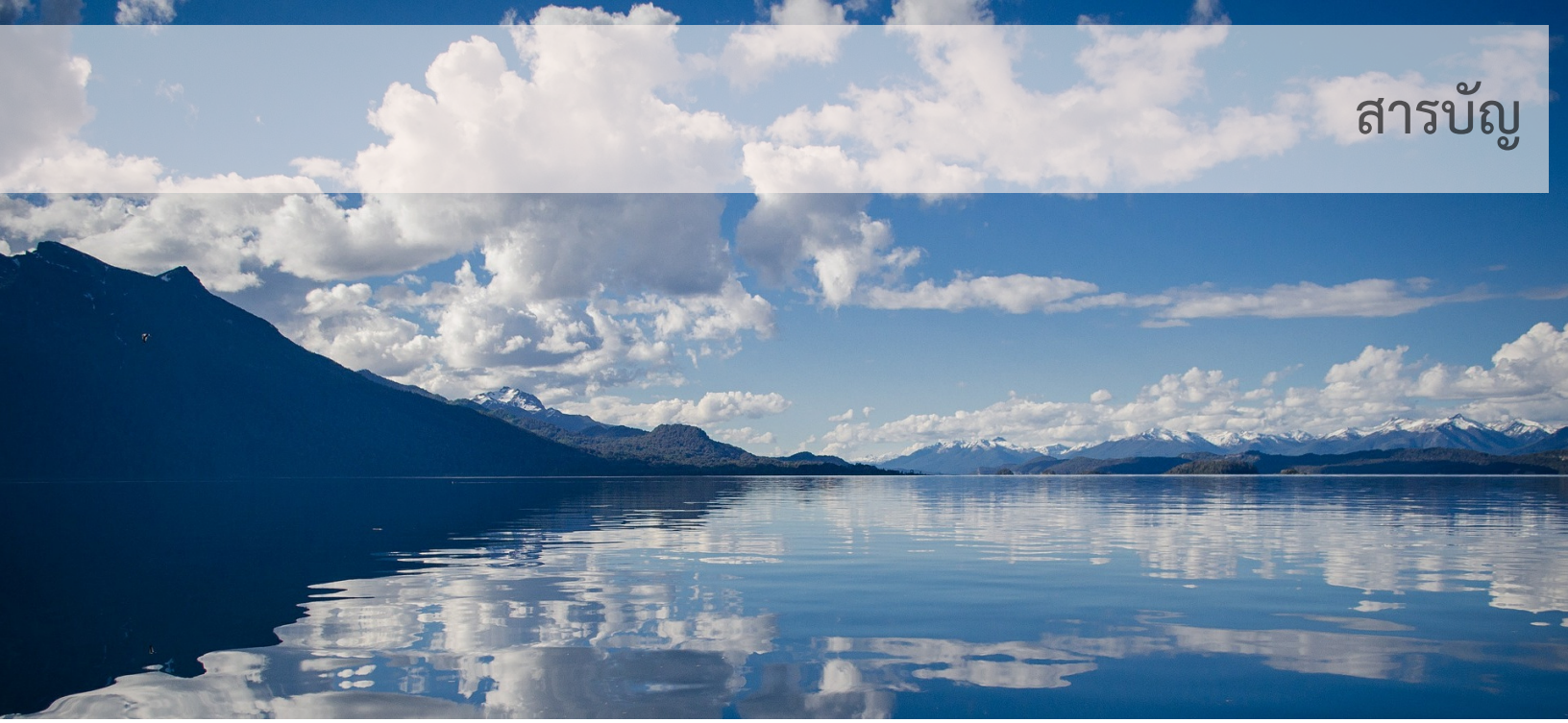


คำนำ

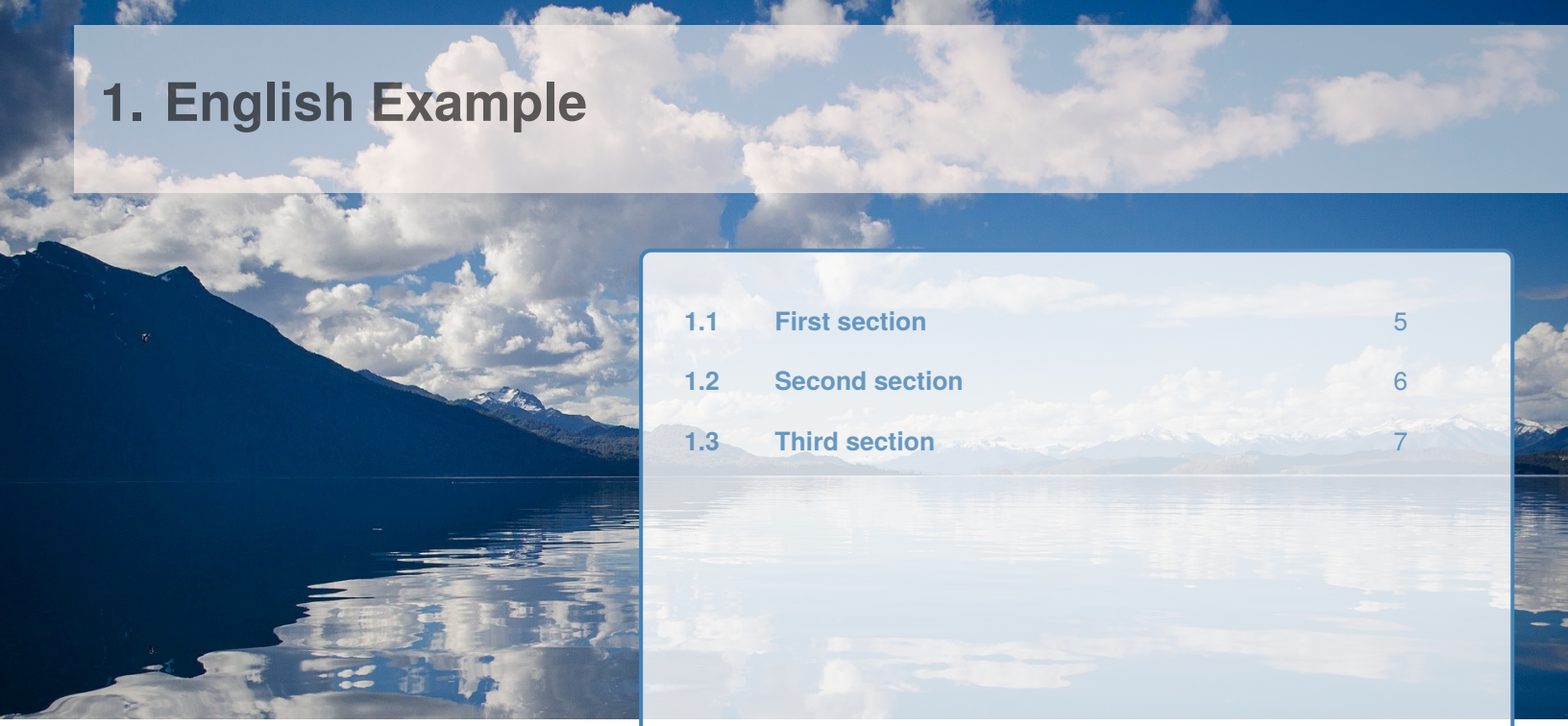
เนื่องจากกำลังหา class LaTeX ดีๆ ที่จะใช้ในการเขียนหนังสือ ได้พอว่ามี tstextbook อันนี้ใช้งานได้ดี เลยเพิ่มส่วนที่ใช้ภาษาไทยลงไปทำให้ใช้งานได้ และมีการปรับแก้อื่นๆ อีกเล็กน้อยเช่น ขนาดของ font ไทยกับอังกฤษที่ต้องเท่ากัน การเพิ่ม listing สำหรับใส่ code ลงไป ทำเสร็จประมาณหนึ่งเลย อยากเผยแพร่ เพื่อไปใช้ประโยชน์กันต่อไป ยังงัยก็ต้องขอขอบคุณเจ้าของ class เดิมและคนที่คิดเกี่ยวกับการใช้ภาษาไทยใน LaTeX หลายๆ คนที่ช่วยกันทำไว้ก่อนหน้านี้ ที่ทำให้เราสามารถพัฒนาและนำมาใช้งานกันได้ต่อไปครับขอบคุณมากๆ

ทวีศักดิ์ สมานชื่น



สารบัญ

1. English Example



This first chapter illustrates how to use various elements of this text book template, such as definitions, theorems and exercises. You may want to start each chapter with a meta summary like this one, to explain to the reader what the chapter is all about, why it is important and how it fits into the bigger picture of the book. Another useful tip is to put the contents of each chapter into a separate LaTeX file and then use the command `\input{}` *to include the chapter in the main document.*

1.1 First section

Let's start out with the following theorem.

Theorem 1.1 (Logic algebra) Let P, Q and R be logical propositions (true or false). Then the following propositions are true:

$P \wedge Q \Leftrightarrow Q \wedge P$	$P \vee Q \Leftrightarrow Q \vee P$	(commutative laws)
$(P \wedge Q) \wedge R \Leftrightarrow P \wedge (Q \wedge R)$	$(P \vee Q) \vee R \Leftrightarrow P \vee (Q \vee R)$	(associative laws)
$P \wedge (Q \vee R) \Leftrightarrow (P \wedge Q) \vee (P \wedge R)$	$P \vee (Q \wedge R) \Leftrightarrow (P \vee Q) \wedge (P \vee R)$	(distributive laws)
$\neg(P \wedge Q) \Leftrightarrow \neg P \vee \neg Q$	$\neg(P \vee Q) \Leftrightarrow \neg P \wedge \neg Q$	(De Morgan's laws)

พิสูจน์. We prove the first of De Morgan's laws and leave the proofs of the remaining propositions as exercises. To prove the statement, we create a truth table and fill in all possible values (true or false) for the propositions P and Q. Each of these propositions can be either true or false and we thus obtain the following truth table with four cases:

$\neg$	$(P$	$\wedge$	$Q)$	$\Leftrightarrow$	$\neg$	P	$\vee$	$\neg$	Q
	T		T			T			T
	T		F			T			F
	F		T			F			T
	F		F			F			F

By definition of the logical operators, we compete the table to obtain

$\neg$	$(P$	$\wedge$	$Q)$	$\Leftrightarrow$	$\neg$	P	$\vee$	$\neg$	Q
F	T	T	T	**T**	F	T	F	F	T
T	T	F	F	**T**	F	T	T	T	F
T	F	F	T	**T**	T	F	T	F	T
T	F	F	F	**T**	T	F	T	T	F

It follows that the statement we want to prove (the equivalence $\Leftrightarrow$) is always true (a *tautology*), which proves the statement. □

1.2 Second section

We begin our next section with the following central definition.

Definition 1.1 (Rational Cauchy sequence) A rational Cauchy sequence is a rational sequence $(x_n)_{n=0}^{\infty}$ such that

$$\forall \epsilon \in \mathbb{Q}_+ \; \exists N \in \mathbb{N} : m, n \geq N \Rightarrow |x_m - x_n| < \epsilon. \tag{1.1}$$

In other words, for each (small) rational number $\epsilon > 0$ there is a (big) number N such that the distance $|x_m - x_n|$ between x_m and x_n is less than ϵ if both m and n are larger than or equal to N.

A remark may be in order here. This definition is concerned with rational *Cauchy sequences. We will later encounter a similar definition of* real *Cauchy sequences.*

Example 1.1 (Solving the equation $x^2 = 2$) Consider the equation $x^2 = 2$. It is easy to prove that this equation does not have any rational solutions. However, consider the following iteration formula:

$$x_n = \frac{x_{n-1} + 2/x_{n-1}}{2}, \tag{1.2}$$

where $n = 1, 2, 3, \ldots$ and $x_0 = 1$. The resulting sequence of rational numbers quickly

approaches a number in the vicinity of $x = 1.4142135623731$:

$$\begin{aligned}
x_0 &= 1 \\
x_1 &= (x_0 + 2/x_0)/2 &&= 1.5 \\
x_2 &= (x_1 + 2/x_1)/2 &&\approx 1.4166666666667 \\
x_3 &= (x_2 + 2/x_2)/2 &&\approx 1.4142156862745 \\
x_4 &= (x_3 + 2/x_3)/2 &&\approx 1.4142135623747 \\
x_5 &= (x_4 + 2/x_4)/2 &&\approx 1.4142135623731 \\
x_6 &= (x_5 + 2/x_5)/2 &&\approx 1.4142135623731 \\
x_7 &= (x_6 + 2/x_6)/2 &&\approx 1.4142135623731 \\
x_8 &= (x_7 + 2/x_7)/2 &&\approx 1.4142135623731 \\
x_9 &= (x_8 + 2/x_8)/2 &&\approx 1.4142135623731 \\
x_{10} &= (x_9 + 2/x_9)/2 &&\approx 1.4142135623731
\end{aligned}$$

We will later see that this iteration, or any other equivalent iteration, defines the real number $\sqrt{2}$.

1.3 Third section

Now let's move on to the definition of the real number system. This may be defined in a multitude of ways, one of which is to think about a real number as a rational Cauchy sequence, or rather the equivalence class of Cauchy sequences "converging to" that number.

Definition 1.2 (The real numbers $\mathbb{R}$) The real numbers $\mathbb{R}$ is the set of all equivalence classes of rational Cauchy sequences.

Now that this is settled, lets prove the completeness of the real number system.

Theorem 1.2 (The completeness of the real numbers) Let $(x_n)_{n=0}^{\infty}$ be a sequence of real numbers. Then $(x_n)_{n=0}^{\infty}$ is convergent if and only if it is also a real Cauchy sequence.

พิสูจน์. Write $x_m = [(x_{mn})_{n=0}^{\infty}]$ where x_{mn} is the nth number in a rational Cauchy sequence representing the real number x_m. And so on…. □

For further reading, there are several excellent works that one could cite, such as [1, 2].

Exercises

Exercise 1.1 Let $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$. Determine the following sets.
(a) $A \cup B$ (b) $A \cap B$ (c) $A \setminus B$ (d) $A \times B$

Exercise 1.2 Let $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 4, 6, 8, 10\}$. Determine the following sets.
(a) $A \cup B$ (b) $A \cap B$ (c) $A \setminus B$ (d) $A \times B$

Exercise 1.3 Let $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$ and $C = \{3, 4, 5\}$. Determine the following sets.
(a) $A \cup B \cup C$ (b) $A \cap B \cap C$ (c) $(B \setminus A) \cap C$ (d) $(A \times B) \times C$

Problem

Problem 1.1 Interpret the following set definition (Russell's paradox) and discuss whether $X \in X$ or $X \notin X$:

$$X = \{x \mid x \notin x\}. \tag{1.3}$$

Computer exercises

Computer exercise 1.1 Write a program that generates the sequence $(x_n)_{n=0}^{100}$ for $x_n = n$.

Computer exercise 1.2 Write a program that generates the odd numbers between 1 and 100.

Computer exercise 1.3 Write a program that computes the sum $\sum_{n=0}^{100} x_n$ for $x_n = n$.

2. ตัวอย่างภาษาไทย

ในบทนี้จะเป็นตัวอย่างการใช้ภาษาไทยร่วมกับภาษาอังกฤษ โดยทำการแปลงจากเนื้อหาในบทที่ 1 เป็นภาษาไทย การใช้งานเป็นอย่างไร มาลองดูกัน ดูตัวอย่างได้จาก code ที่ใช้ทำเอกสารนี้ได้ลย

2.1 การเขียนทฤษฎี

ลองเริ่มต้นด้วยการเขียนเกี่ยวกับทฤษฎี จะเห็นว่าหัวข้อ theorem ยังคงเป็นภาษาอังกฤษอยู่ ถ้าต้องการเปลี่ยนไปเป็นภาษาไทยทำได้โดยการไปแก้ไขใน class หรืออาจจะทำเป็นรูปแบบของการแปลภาษาก็น่าจะสะดวกไว้มีเวลาจะดำเนินการต่อ ตอนนี้ขอเป็นแบบ ภาษาอังกฤษไปก่อน

Theorem 2.1 (Logic algebra) กำหนดให้ P, Q และ R มีทฤษฎีบทเป็นลอจิกคือ จริง หรือ เท็จ ดังนั้นทฤษฎีบทต่อไปนี้จะเป็นจริง

$P \wedge Q \Leftrightarrow Q \wedge P$	$P \vee Q \Leftrightarrow Q \vee P$	(commutative laws)
$(P \wedge Q) \wedge R \Leftrightarrow P \wedge (Q \wedge R)$	$(P \vee Q) \vee R \Leftrightarrow P \vee (Q \vee R)$	(associative laws)
$P \wedge (Q \vee R) \Leftrightarrow (P \wedge Q) \vee (P \wedge R)$	$P \vee (Q \wedge R) \Leftrightarrow (P \vee Q) \wedge (P \vee R)$	(distributive laws)
$\neg(P \wedge Q) \Leftrightarrow \neg P \vee \neg Q$	$\neg(P \vee Q) \Leftrightarrow \neg P \wedge \neg Q$	(De Morgan's laws)

พิสูจน์. เราพิสูจน์กฎแรกของเดอร์แกนและทิ้งส่วนที่เหลือไว้เป็นแบบฝึกหัด เพื่อพิสูจน์กฎดังกล่าว เราสร้างตารางความจริงและใส่ค่าที่เป็นไปได้ทั้งหมดซึ่งประกอบไปด้วย จริง หรือ เท็จ ของ P และ Q หลังจากนั้นเราได้ตารางความจริงซึ่งตารางจะประกอบไปด้วย 4 กรณี ดังนี้

$\neg$	$(P$	$\wedge$	$Q)$	$\Leftrightarrow$	$\neg$	P	$\vee$	$\neg$	Q
	T		T			T			T
	T		F			T			F
	F		T			F			T
	F		F			F			F

จากนิยามของการดำเนินการทางด้านลอจิก เราสามารถสร้างตารางที่สมบูรณ์ได้ดังนี้

$\neg$	$(P$	$\wedge$	$Q)$	$\Leftrightarrow$	$\neg$	P	$\vee$	$\neg$	Q
F	T	T	T	**T**	F	T	F	F	T
T	T	F	F	**T**	F	T	T	T	F
T	F	F	T	**T**	T	F	T	F	T
T	F	F	F	**T**	T	F	T	T	F

ตามนิยามที่ได้กำหนดไว้ตอนต้นเราสามารถพิสูจน์ให้เห็นว่าค่าประพจน์ที่กำหนดนั้นเป็นจริง (the equivalence $\Leftrightarrow$) ทุกเงื่อนไขที่เป็นไปได้ □

2.2 การนิยาม

ในเนื้อหาส่วนนี้เราจะพูดถึงการนิยาม หรือ definition กัน ว่าใน class นี้จะออกมาหน้าตาอย่างไร และใช้งานอย่างไรให้ดู code ประกอบไปด้วย

Definition 2.1 (Rational Cauchy sequence) A rational Cauchy sequence is a rational sequence $(x_n)_{n=0}^{\infty}$ such that

$$\forall \epsilon \in \mathbb{Q}_+ \; \exists N \in \mathbb{N} : m, n \geq N \Rightarrow |x_m - x_n| < \epsilon. \tag{2.1}$$

In other words, for each (small) rational number $\epsilon > 0$ there is a (big) number N such that the distance $|x_m - x_n|$ between x_m and x_n is less than ϵ if both m and n are larger than or equal to N.

การเขียนหมายเลขของสมการ ก็ใช้แบบเดียวกับเขียนในสมการทั่วไป

Example 2.1 (แก้สมการ $x^2 = 2$) Consider the equation $x^2 = 2$. It is easy to prove that this equation does not have any rational solutions. However, consider the following iteration formula:

$$x_n = \frac{x_{n-1} + 2/x_{n-1}}{2}, \tag{2.2}$$

where $n = 1, 2, 3, \ldots$ and $x_0 = 1$. The resulting sequence of rational numbers quickly

approaches a number in the vicinity of $x = 1.4142135623731$:

$$\begin{aligned}
x_0 &= 1 \\
x_1 &= (x_0 + 2/x_0)/2 &&= 1.5 \\
x_2 &= (x_1 + 2/x_1)/2 &&\approx 1.4166666666667 \\
x_3 &= (x_2 + 2/x_2)/2 &&\approx 1.41421568627745 \\
x_4 &= (x_3 + 2/x_3)/2 &&\approx 1.41421356237747 \\
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x_8 &= (x_7 + 2/x_7)/2 &&\approx 1.41421356237731 \\
x_9 &= (x_8 + 2/x_8)/2 &&\approx 1.41421356237731 \\
x_{10} &= (x_9 + 2/x_9)/2 &&\approx 1.41421356237731
\end{aligned}$$

We will later see that this iteration, or any other equivalent iteration, defines the real number $\sqrt{2}$.

2.3 การใส่ Code

เนื่องจากหนังสือที่เขียนจะต้องมีส่วนประกอบของ code ด้วย ดังนั้นส่วนนี้จึงจะต้องทำเพิ่มเติมขึ้นมากจากที่ code เดิมได้เตรียมไว้ให้ ผลลัพธ์จะออกมาเป็นอย่างไรมาลองดูกันเลย สำหรับวิธีใช้ไปดูจากตัว source code กันนะ ไม่ขออธิบายในนี้

```
import numpy as np

def incmatrix(genl1,genl2):
    m = len(genl1)
    n = len(genl2)
    M = None #to become the incidence matrix
    VT = np.zeros((n*m,1), int)  #dummy variable

    #compute the bitwise xor matrix
    M1 = bitxormatrix(genl1)
    M2 = np.triu(bitxormatrix(genl2),1)

    for i in range(m-1):
        for j in range(i+1, m):
            [r,c] = np.where(M2 == M1[i,j])
            for k in range(len(r)):
                VT[(i)*n + r[k]] = 1;
                VT[(i)*n + c[k]] = 1;
                VT[(j)*n + r[k]] = 1;
                VT[(j)*n + c[k]] = 1;
```

```
21
22                  if M is None:
23                      M = np.copy(VT)
24                  else:
25                      M = np.concatenate((M, VT), 1)
26
27                  VT = np.zeros((n*m,1), int)
28
29      return M
```

Listing 2.1: Python example

Exercises

Exercise 2.1 Let $A = \{1,2,3\}$ and $B = \{2,3,4\}$. Determine the following sets.
(a) $A \cup B$ (b) $A \cap B$ (c) $A \setminus B$ (d) $A \times B$

Exercise 2.2 Let $A = \{1,3,5,7,9\}$ and $B = \{2,4,6,8,10\}$. Determine the following sets.
(a) $A \cup B$ (b) $A \cap B$ (c) $A \setminus B$ (d) $A \times B$

Exercise 2.3 Let $A = \{1,2,3\}$, $B = \{2,3,4\}$ and $C = \{3,4,5\}$. Determine the following sets.
(a) $A \cup B \cup C$ (b) $A \cap B \cap C$ (c) $(B \setminus A) \cap C$ (d) $(A \times B) \times C$

Problem

Problem 2.1 Interpret the following set definition (Russell's paradox) and discuss whether $X \in X$ or $X \notin X$:

$$X = \{x \mid x \notin x\}. \tag{2.3}$$

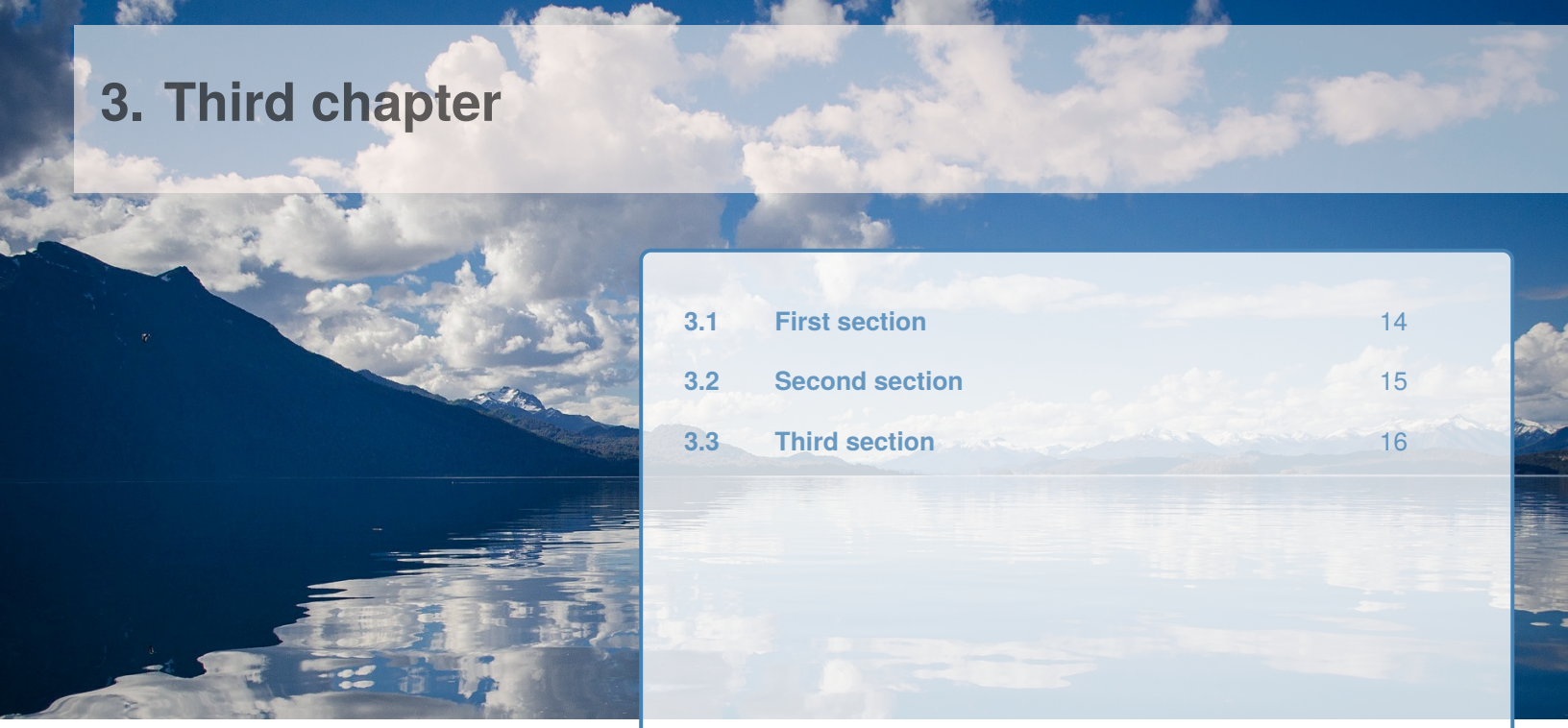
Computer exercises

Computer exercise 2.1 Write a program that generates the sequence $(x_n)_{n=0}^{100}$ for $x_n = n$.

Computer exercise 2.2 Write a program that generates the odd numbers between 1 and 100.

Computer exercise 2.3 Write a program that computes the sum $\sum_{n=0}^{100} x_n$ for $x_n = n$.

3. Third chapter



Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

3.1 First section

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If

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After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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3.2 Second section

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

3.3 Third section

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written

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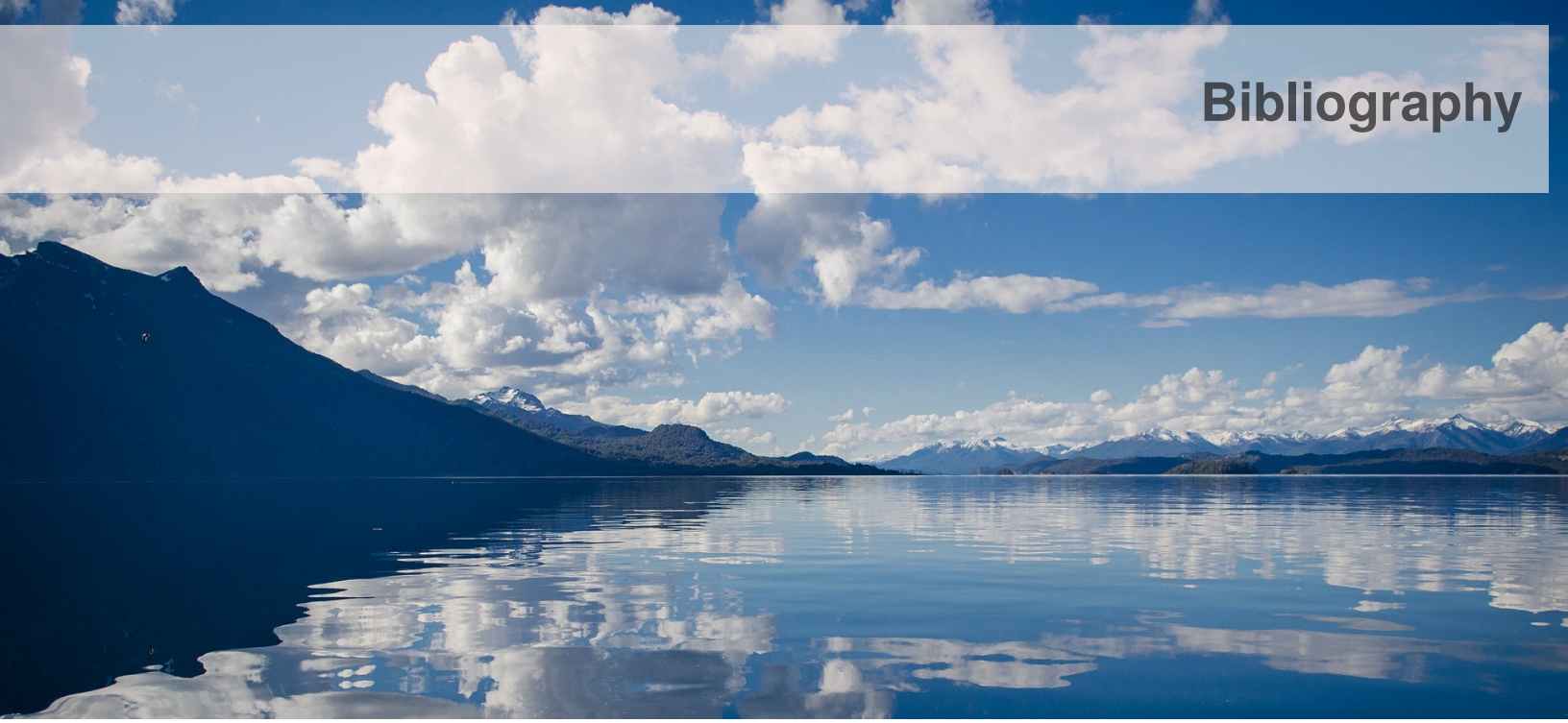
And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.



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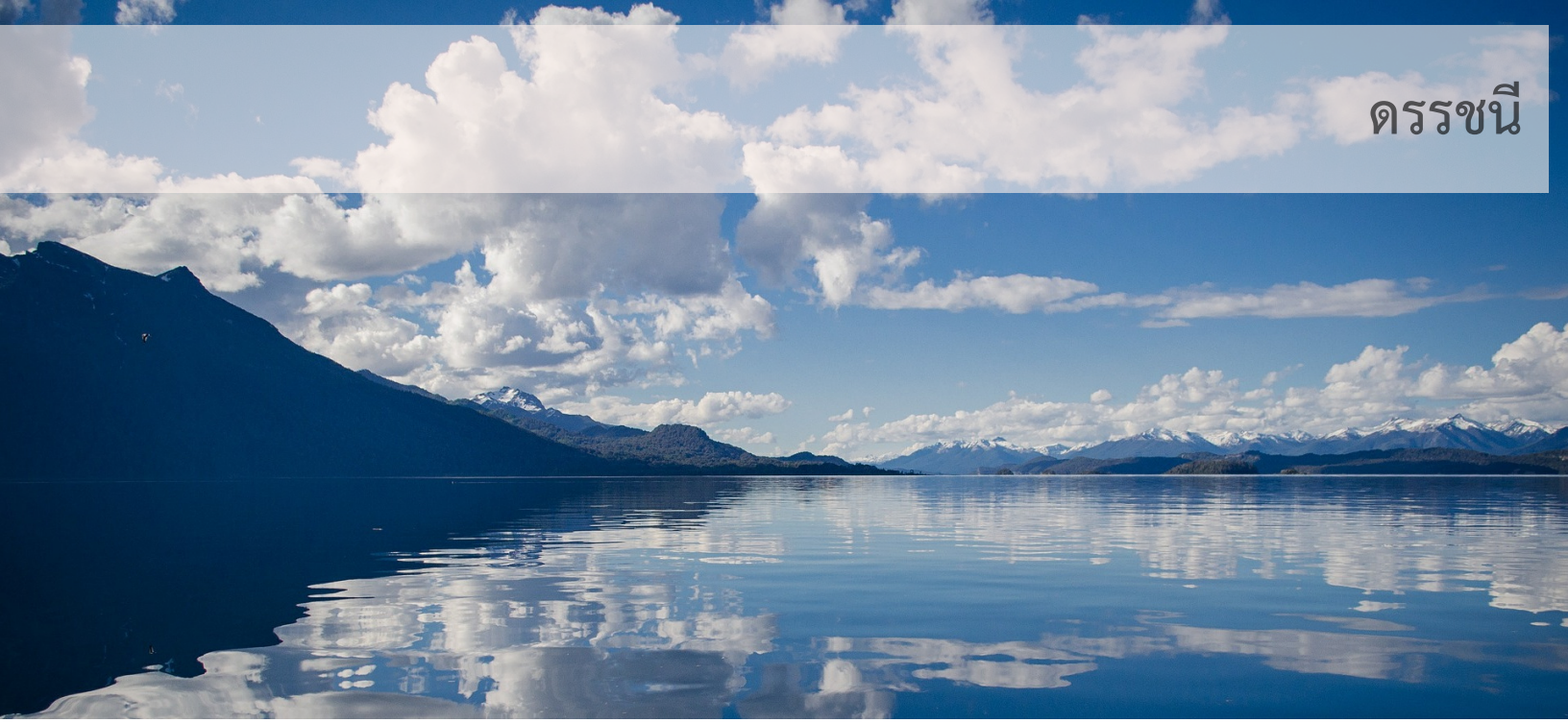

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