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NAME SURNAME

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IN MATHEMATICS

GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
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A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MATHEMATICS

GRADUATE SCHOOL, CHIANG MAI UNIVERSITY
MAY 2017

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THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN MATHEMATICS

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(Prof. Dr. Name4 Surname4)

..... Member
(Prof. Dr. Name1 Surname1)

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(Assoc. Prof. Dr. Name2 Surname2)

Advisor :

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(Prof. Dr. Name1 Surname1)

8 May 2017

To

My Family

ACKNOWLEDGEMENT

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หัวข้อวิทยานิพนธ์ ชื่อเรื่องภาษาไทย สำหรับหน้าบทคัดย่อภาษาไทย

ผู้เขียน นายชื่อ นามสกุล

ปริญญา ปรัชญาดุษฎีบัณฑิต (คณิตศาสตร์)

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บทคัดย่อ

บทคัดย่อภาษาไทย.....

Thesis Title	This Is the First Line of the Title with the Second Line Here before the Third Line
Author	Mr. Name Surname
Degree	Master of Science (Mathematics)
Advisor	Prof. Dr. Name1 Surname1

ABSTRACT

Abstract in English.....

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ข้อความแห่งการริเริ่ม

ข้าพเจ้าขอรับรองว่าดุษฎีนิพนธ์เล่มนี้เป็นผลงานของข้าพเจ้า ซึ่งไม่มีส่วนหนึ่งส่วนใดละเมิดลิขสิทธิ์และทรัพย์สินทางปัญญาของผู้อื่น ผลงานการวิจัยนี้ไม่ได้รับการตีพิมพ์หรือเขียนโดยบุคคลอื่นมาก่อนยกเว้นส่วนอ้างอิงเพื่อความสมบูรณ์ของรูปเล่มดุษฎีนิพนธ์

กราฟ $\mathcal{F}_{u,n}^{K}$ และ $\widehat{\mathcal{F}}_{u,n}^{K}$ ในวิทยานิพนธ์เล่มนี้ เป็นองค์ประกอบเชิงคณิตศาสตร์ที่ถูกนิยามขึ้นมาใหม่ โดยขยายแนวคิดมาจากกราฟ $\mathcal{F}_{u,n}$ และ $\widehat{\mathcal{F}}_{u,n}$ ดังนั้นสมบัติของกราฟ $\mathcal{F}_{u,n}^{K}$ และ $\widehat{\mathcal{F}}_{u,n}^{K}$ จึงยังไม่ได้รับการศึกษามาก่อน นอกจากนี้เรายังตรวจสอบสมบัติใหม่ ๆ ของกราฟ $\mathcal{F}_{u,n}$ และ $\widehat{\mathcal{F}}_{u,n}$ ซึ่งสามารถขยายไปสู่กราฟ $\mathcal{G}_{u,n}$ และ $\widehat{\mathcal{G}}_{u,n}$ ได้

ดุษฎีนิพนธ์เล่มนี้ได้รับการอนุมัติโดยคณะกรรมการสอบดุษฎีนิพนธ์และบัณฑิตวิทยาลัย โดยที่ไม่เคยถูกใช้เพื่อสำเร็จการศึกษาหรือประโยชน์อื่นใด

STATEMENT OF ORIGINALITY

I hereby certify that I am the author of this dissertation. To the best of my knowledge, there are not any parts of this research infringing anyone's copyright and intellectual property. The dissertation does not contain any materials previously written or published by other people except appropriate references for the sake of completeness.

I declare that the graphs $\mathcal{F}_{u,n}^K$ and $\widehat{\mathcal{F}}_{u,n}^K$ are the new mathematical objects generalized from $\mathcal{F}_{u,n}$ and $\widehat{\mathcal{F}}_{u,n}$. Therefore, the results for $\mathcal{F}_{u,n}^K$ and $\widehat{\mathcal{F}}_{u,n}^K$ are new. We also investigated some new properties of $\mathcal{F}_{u,n}$ and $\widehat{\mathcal{F}}_{u,n}$ including $\mathcal{F}_{u,n}^K$ and $\widehat{\mathcal{F}}_{u,n}^K$ and then extended them to the graphs $\mathcal{G}_{u,n}$ and $\widehat{\mathcal{G}}_{u,n}$.

This is a true copy of my dissertation including any final corrections approved by the dissertation examining committee and the Graduate School. The dissertation has not been accepted for a degree or diploma at any educational institution or university.

CHAPTER 1

Introduction

1.1 Examples of Tables

Table 1.1: The Number of Animals in Zoos of Chiang Mai

No.	**Zoos**	**The Number of Animals**
1	Chiang Mai Zoo	1,158
2	Chiang Mai Night Safari	849
Total		2,007

1.2 Examples of figures

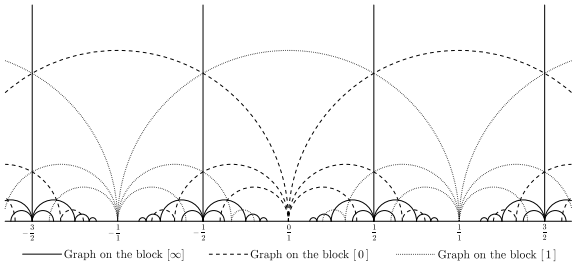

Figure 1.1: The Generalized Farey Graph $\mathcal{G}_{1,2}$

1.3 Examples of Theorem and Related Environments

Definition 1.3.1. *quadrangle* is a geometric object consisting of four sides and four vertices

Notation 1.3.2. content...

Example 1.3.3. content...

1.3.1. content...

Lemma 1.3.4. *content...*

Proof. content... □

Proposition 1.3.5. *content...*

Sketch of Proof. content... □

Theorem 1.3.6. *content...*

Corollary 1.3.7. *content...*

Remark 1.3.8. *content...*

Conjecture 1.3.9. *content...*

1.4 Math Mode in LaTeX

1.4.1 Inline Math

It has been known that the equation $e = mc^2$ was investigated by Albert Einstein.

1.4.2 Display Math

It has been known that the equation

$$e = mc^2$$

was investigated by Albert Einstein.

It has been known that the equation

$$e = mc^2 \tag{1.1}$$

was investigated by Albert Einstein.

Suppose that $ad - bc = 1$ and $cz^2 + (d - a)z - b = 0$. The solutions of the quadratic equation are shown below;

$$z = \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c} \tag{1.2}$$

$$= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad - bc)}}{2c} \tag{1.3}$$

$$= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c}. \tag{1.4}$$

$$z = \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c} \tag{1.5}$$

$$= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad - bc)}}{2c}$$

$$= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c} \tag{1.6}$$

$$
\begin{aligned}
z &= \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c} \\
&= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad-bc)}}{2c} \\
&= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c}
\end{aligned} \tag{1.7}
$$

$$
z = \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c} \tag{1.8a}
$$

$$
\begin{aligned}
&= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad-bc)}}{2c} \\
&= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c}
\end{aligned} \tag{1.8b}
$$

1.5 Labeling and Referencing

Section 1.5 of Chapter 1 describes how we can label and reference our equations.

1.5.1 Tables and Figures

Table 1.2: The Number of Animals in Zoos of Chiang Mai

No.	**Zoos**	**The Number of Animals**
1	Chiang Mai Zoo	1,158
2	Chiang Mai Night Safari	849
Total		2,007

Table 1.2 shows the numbers of animals in Chiang Mai Zoo and Chiang Mai Night Safari.

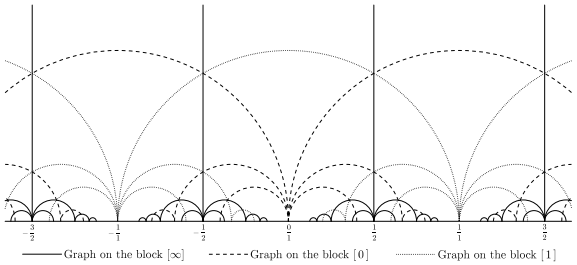

Figure 1.2: The Graph $\mathcal{G}_{1,2}$

Figure 1.2 demonstrates a part of the graph $\mathcal{G}_{1,2}$

1.5.2 Equations

$$e = mc^2 \tag{1.9}$$

It has been known that the equation (1.9) was investigated by Albert Einstein.

$$\begin{aligned} z &= \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c} && (1.10)\\ &= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad-bc)}}{2c} && (1.11)\\ &= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c}. && (1.12) \end{aligned}$$

(1.10) is the quadratic formula. Then we add $+4ad - 4ad$ in the square root and obtain (1.11) by regrouping the variables. Finally, replacing $ad - bc$ by 1 provides (1.12).

$$\begin{aligned} z &= \frac{-(d-a) \pm \sqrt{(d-a)^2 - 4c(-b)}}{2c}\\ &= \frac{(a-d) \pm \sqrt{d^2 + 2ad + a^2 - 4(ad-bc)}}{2c}\\ &= \frac{(a-d) \pm \sqrt{(d+a)^2 - 4}}{2c}. && (1.13) \end{aligned}$$

(1.13) is the simplest form of z.

1.5.3 Theorem and Others

Theorem 1.5.1. *The Farey graph $\mathcal{F}$ is 3-chromatic.*

Theorem 1.5.1 is the first result of chromatic numbers for the graphs $\mathcal{F}_{u,n}^K$.

Theorem 1.5.2. *The Farey graph $\mathcal{F}$ is 3-chromatic.*

Theorem 1.5.2 is the first result of chromatic numbers for the graphs $\mathcal{F}_{u,n}^K$.

Theorem 1.5.2 is the first result of chromatic numbers for the graphs $\mathcal{F}_{u,n}^K$.

CHAPTER 2

Preliminaries

CHAPTER 3

Main Results

CHAPTER 4

Conclusion

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APPENDIX A

Test Appendix

A.1 Test section

A.1.1 Test subsection

A.1.2 Test subsection

drgdgdg

APPENDIX B

Test

APPENDIX C

Test

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