

Thesis Title

by

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A.A.S., University of Southern Swampland, 1988
M.S., Art Therapy, University of New Mexico, 1991

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science
Mathematics

The University of New Mexico

Albuquerque, New Mexico

December, 2006

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Dedication

This work is dedicated to my mother and father and to the many others, though unnamed, who helped me in the completion of this task.

“A bird in hand is worth two in the bush” – Anonymous

Acknowledgments

I would like to thank my advisor, Professor Martin Sheen, for his support and some great action movies. I would also like to thank my dog, Spot, who only ate my homework two or three times. I have several other people I would like to thank, as well.¹

¹To my brother and sister, who are really cool.

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ABSTRACT OF THESIS

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Abstract

We study the effects of warm water on the local penguin population. The major finding is that it is extremely difficult to induce penguins to drink warm water. The success factor is approximately $-e^{-i\pi} - 1$. Replace this text with your own abstract.

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Glossary

a_{lm}	Taylor series coefficients, where $l, m = \{0..2\}$
$A_{\mathbf{p}}$	Complex-valued scalar denoting the amplitude and phase.
A^T	Transpose of some relativity matrix.

Introduction

Every dissertation should have an introduction. You might not realize it, but the introduction should introduce the concepts, background, and goals of the dissertation.

Chapter 1

Sample Mathematics and Text

1.1 In-line and Displayed Mathematics

The expression $\sum_{i=1}^{\infty} a_i$ is in-line mathematics, while the numbered equation

$$\sum_{i=1}^{\infty} a_i \tag{1.1}$$

is displayed and automatically numbered as equation 1.1.

Let H be a Hilbert space, C be a closed bounded convex subset of H , T a nonexpansive self map of C . Suppose that as $n \rightarrow \infty$, $a_{n,k} \rightarrow 0$ for each k , and $\gamma_n = \sum_{k=0}^{\infty} (a_{n,k+1} - a_{n,k})^+ \rightarrow 0$. Then for each x in C , $A_n x = \sum_{k=0}^{\infty} a_{n,k} T^k x$ converges weakly to a fixed point of T .

Two sets of \LaTeX parameters govern mathematical displays.¹ The spacing above and below a display depends on whether the lines above or below are short or long, as shown in the following examples.

¹ \LaTeX automatically selects the spacing depending on the surrounding line lengths.

Chapter 1. Sample Mathematics and Text

A short line above:

$$x^2 + y^2 = z^2$$

and a short line below.

A long line above may depend on your margins

$$\sin^2 \theta + \cos^2 \theta = 1$$

as will a long line below. This line is long enough to illustrate the spacing for mathematical displays, regardless of the margins.

1.2 Mathematics in Section Heads $\int_{\alpha}^{\beta} \ln t dt$

Mathematics can appear in section heads. Note that mathematics in section heads may cause difficulties in typesetting styles with running headers or table of contents entries.

1.3 Theorems, Lemmata, and Other Theorem-like Environments

A number of theorem-like environments is available. The following lemma is a well-known fact on differentiation of asymptotic expansions of analytic functions.

Lemma 1 *Let $f(z)$ be an analytic function in \mathbb{C}_+ . If $f(z)$ admits the representation*

$$f(z) = a_0 + \frac{a_1}{z} + o\left(\frac{1}{z}\right),$$

for $z \rightarrow \infty$ inside a cone $\Gamma_{\varepsilon} = \{z \in \mathbb{C}_+ : 0 < \varepsilon \leq \arg z \leq \pi - \varepsilon\}$ then

$$a_1 = -\lim_{z \rightarrow \infty, z \in \Gamma_{\varepsilon}} z^2 f'(z), \quad (1.2)$$

Chapter 1. Sample Mathematics and Text

Proof. Change z for $1/z$. Then $\Gamma_\varepsilon \rightarrow \bar{\Gamma}_\varepsilon = \{z \in \mathbb{C}_- : \bar{z} \in \Gamma_\varepsilon\}$ and

$$f(1/z) = a_0 + a_1 z + o(z). \quad (1.3)$$

Fix $z \in \bar{\Gamma}_\varepsilon$, and let $C_r(z) = \{\lambda \in \mathbb{C}_- : |\lambda - z| = r\}$ be a circle with radius $r = |z| \sin \varepsilon/2$. It follows from (1.3) that

$$\frac{1}{2\pi i} \int_{C_r(z)} \frac{f(\lambda) d\lambda}{(\lambda - z)^2} = \sum_{m=0}^1 a_m \frac{1}{2\pi i} \int_{C_r(z)} \frac{(\lambda - z_0)^m d\lambda}{(\lambda - z)^2} + R(z), \quad (1.4)$$

where for the remainder $R(z)$ we have

$$\begin{aligned} |R(z)| &\leq r^{-1} \max_{\lambda \in C_r(z)} o(|z|) = r^{-1} \max_{\lambda \in C_r(z)} |\lambda| \cdot O(|z| + r) \\ &= \frac{|z| + r}{r} \cdot O(|z| + r) = \frac{1 + \sin \varepsilon}{\sin \varepsilon} \cdot O(|z|). \end{aligned}$$

Therefore $R(z) \rightarrow 0$ as $z \rightarrow \infty$, $z \in \bar{\Gamma}_{\varepsilon/2}$, and hence by the Cauchy theorem (1.4) implies

$$\frac{d}{dz} f(1/z) = a_1 + R(z) \rightarrow a_1, \text{ as } z \rightarrow \infty, z \in \bar{\Gamma}_{\varepsilon/2},$$

that implies (1.2) by substituting $1/z$ back for z . ■

Appendix A

Proving $E = MC^2$

I refer the reader to many of grandpa's famous books on this subject.

Appendix B

Derivation of $A = \pi r^2$

A circle is really a square without corners. QED.