

Preface

You wouldn't think that surviving a math museum would be so hard, but this is the story of just that, surviving a math museum. Kallie, a sixteen-year-old, finds herself confronting the worst nightmares that can be conjured from mathematics. And although she starts with an aversion to math, she ends up appreciating the beauty and elegance of the subject even as she is doing her best to keep herself and her companions alive.

Math *is* an awe-inspiring field. Although critically important for its applications that have revolutionized our world (think electricity, computers, cellphones, spacecraft, MRI's, etc.), math is also inherently beautiful. The interlocking logical framework that allows us to prove that a certain result, sometimes counterintuitive, is nevertheless true, is unto itself marvelous to behold. Like the physical structures that are the realization of an architect's imagination, these intellectual edifices, with their complex and intricate interconnections, require just as creative a process for their formation. These results are a dramatic testimony to the ingenuity of their creators, and as deserving of veneration as the works of any great artist, composer or author.

But many people do not see it this way. They suffer through basic math and regard it as a set of logical rules to which they are required to adhere. Where is the beauty in that? They never experience the awe of a truly beautiful and unexpected result.

So, with a few exceptions, each chapter in this book presents a different math result, often in the context of surviving it. For each such result, there is an associated appendix that provides a bit more detail about the topic and that is followed by a handful of relevant exercises—just an opportunity to think further about the subject.

This book can be read by anyone with an interest in math. And even if you are not into math (yet...), you can read the book, and hopefully enjoy it, and maybe look at mathematics in a new light. Don't worry about not having the right background. The prerequisite is high school math and really just a lot of curiosity.

This book is also appropriate for a math club, book club or discussion group. The appendices and exercises will help to facilitate further discussion.

It can also be used as supplemental material for a math class. The level is appropriate for either high school or college classes.

Originally, I wrote a short story about the Math Museum that appeared in the *Mathematical Intelligencer* in my *Mathematically Bent* column. But the story begged to be expanded, and this book is the result. I appreciate everyone who at various points gave me feedback on the manuscript, and especially Stephen Kennedy and the board of the Anneli Lax New Mathematical Library for their detailed and helpful suggestions.

I had a lot of fun writing the book. I hope you have fun reading it.

-Colin Adams

Figure Credits

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All other figures by Colin Adams.

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Prologue

I figured I could just open the door a crack and get a peek at this kooky function. What harm would there be in that?

But when I turned the handle on the door, suddenly the buzzing went crazy. I slapped my hands over my ears, when I should have jerked the door shut. It flew open, and I was face-to-face with the Weierstrass function. It was the ugliest function I could imagine, with kinks, and kinks on kinks and kinks on those. And it was shrieking in its buzz-like way, vibrating all over like a plucked string. I stood there, frozen for just a second, and then I was sprinting after the others, with the wild frantic buzzing right behind me.

The others looked surprised as I came charging down the hall after them.

“Run!!!” I screamed.

“Kallie. . .,” said Dad.

“I’ll be sorry later Dad! Just run!” My dad’s eyes widened as the angry buzzing grew dramatically in volume, and then we were all sprinting ahead of it down the corridor.

As we skidded around a right-angle turn, I looked back just for a second. The Weierstrass function didn’t make the corner but instead plowed into the wall in front of it. It was as if a giant chainsaw had jammed itself into the wall. Sawdust flew in every direction as the function chewed the wall to splinters.

“Speed up!” I screamed. Up ahead the hall was dark.

“Just keep running,” Dad huffed. I could hear the Weierstrass function disembedding itself from the wall and then it was in hot pursuit once again.

Suddenly, as I went to plant my foot, I didn’t hit the floor, as there was no floor to hit. I could hear Maria shriek as we all tumbled forward and down into space.