



openstax™

# Calc- ulus

Volume 1

## OPENSTAX

OpenStax provides free, peer-reviewed, openly licensed textbooks for introductory college and Advanced Placement® courses and low-cost, personalized courseware that helps students learn. A nonprofit ed tech initiative based at Rice University, we're committed to helping students access the tools they need to complete their courses and meet their educational goals.

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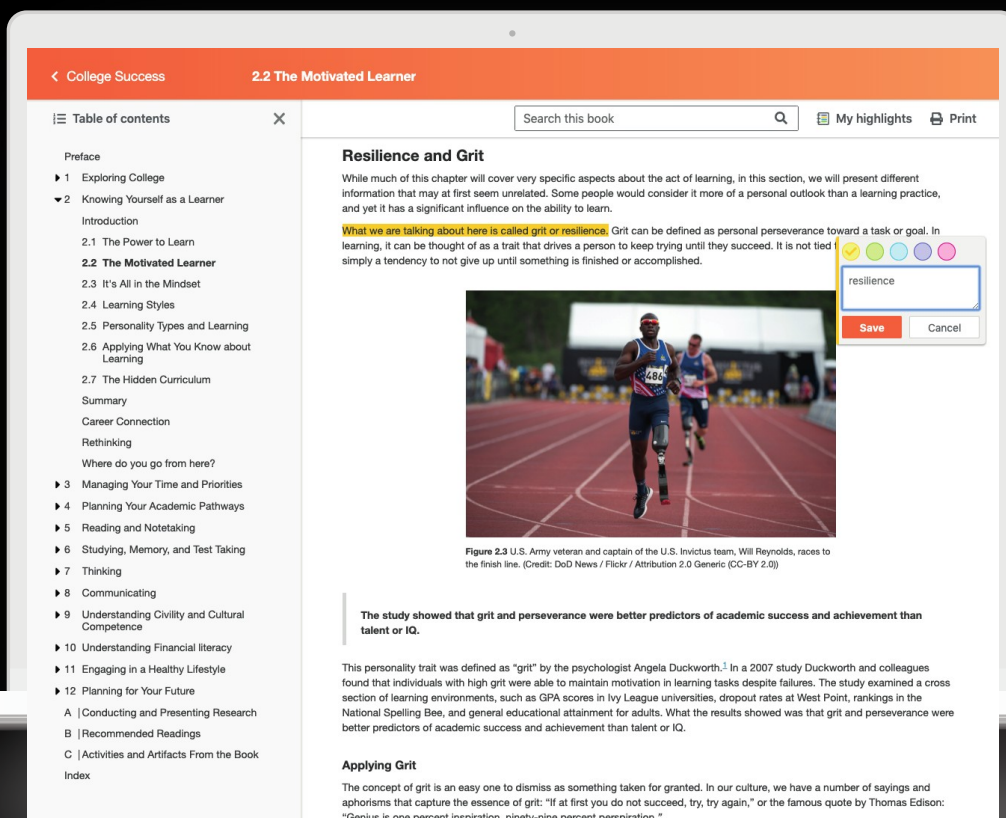
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**Resilience and Grit**

While much of this chapter will cover very specific aspects about the act of learning, in this section, we will present different information that may at first seem unrelated. Some people would consider it more of a personal outlook than a learning practice, and yet it has a significant influence on the ability to learn.

**What we are talking about here is called grit or resilience.** Grit can be defined as personal perseverance toward a task or goal. In learning, it can be thought of as a trait that drives a person to keep trying until they succeed. It is not tied simply a tendency to not give up until something is finished or accomplished.



**Figure 2.3** U.S. Army veteran and captain of the U.S. Invictus team, Will Reynolds, races to the finish line. (Credit: DoD News / Flickr / Attribution 2.0 Generic (CC-BY 2.0))

**The study showed that grit and perseverance were better predictors of academic success and achievement than talent or IQ.**

This personality trait was defined as "grit" by the psychologist Angela Duckworth.<sup>1</sup> In a 2007 study Duckworth and colleagues found that individuals with high grit were able to maintain motivation in learning tasks despite failures. The study examined a cross section of learning environments, such as GPA scores in Ivy League universities, dropout rates at West Point, rankings in the National Spelling Bee, and general educational attainment for adults. What the results showed was that grit and perseverance were better predictors of academic success and achievement than talent or IQ.

**Applying Grit**

The concept of grit is an easy one to dismiss as something taken for granted. In our culture, we have a number of sayings and aphorisms that capture the essence of grit: "If at first you do not succeed, try, try again," or the famous quote by Thomas Edison: "Genius is one percent inspiration, ninety-nine percent perspiration."

resilience

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# PREFACE

Welcome to *Calculus Volume 1*, an OpenStax resource. This textbook was written to increase student access to high-quality learning materials, maintaining highest standards of academic rigor at little to no cost.

## About OpenStax

OpenStax is a nonprofit based at Rice University, and it's our mission to improve student access to education. Our first openly licensed college textbook was published in 2012, and our library has since scaled to over 25 books for college and AP<sup>®</sup> courses used by hundreds of thousands of students. OpenStax Tutor, our low-cost personalized learning tool, is being used in college courses throughout the country. Through our partnerships with philanthropic foundations and our alliance with other educational resource organizations, OpenStax is breaking down the most common barriers to learning and empowering students and instructors to succeed.

## About OpenStax's resources

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### Format

You can access this textbook for free in web view or PDF through OpenStax.org, and for a low cost in print.

## About *Calculus Volume 1*

Calculus is designed for the typical two- or three-semester general calculus course, incorporating innovative features to enhance student learning. The book guides students through the core concepts of calculus and helps them understand how those concepts apply to their lives and the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency. Volume 1 covers functions, limits, derivatives, and integration.

### Coverage and scope

Our *Calculus Volume 1* textbook adheres to the scope and sequence of most general calculus courses nationwide. We have worked to make calculus interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of the three volumes of *Calculus* have been developed and arranged to provide a logical progression from fundamental to more advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from mathematics educators dedicated to the project.