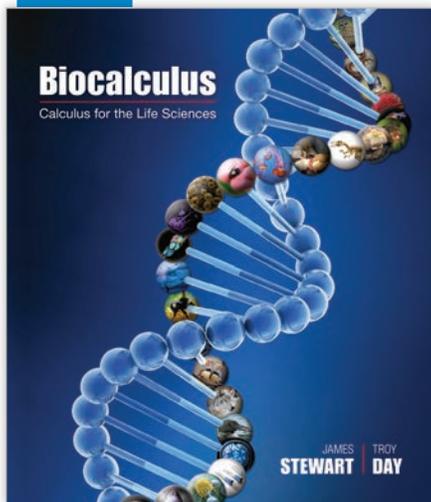


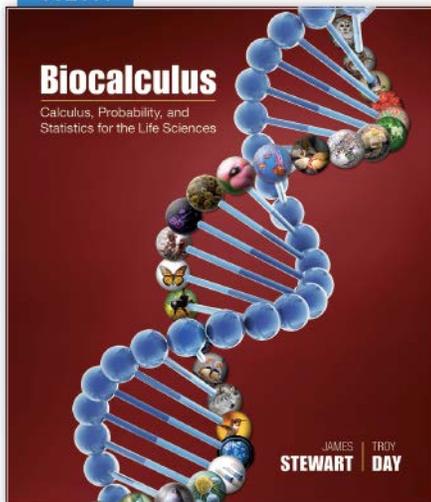
NEW!



Biocalculus: Calculus for the Life Sciences, 1e

James Stewart | Troy Day
ISBN-13: 978-1-133-10963-1
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NEW!



Biocalculus: Calculus, Probability, and Statistics for the Life Sciences

James Stewart | Troy Day
ISBN-13: 978-1-305-11403-6
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New from James Stewart and Troy Day: *Biocalculus: Calculus for the Life Sciences* and *Biocalculus: Calculus, Probability, and Statistics for the Life Sciences*. The first book includes content on calculus and differential equations, as well as important aspects of linear algebra. The second book includes all content from the first, as well as topics in probability and statistics. Both texts show students how mathematics relates to biology, with a style that maintains rigor without being overly formal.

DIVERSE MATERIALS ALLOW FOR FLEXIBLE COURE DESIGN

Some life science calculus courses are similar to other calculus offerings but are presented in the context of biological examples. Others are more radical departures from mathematical tradition and instead are influenced heavily by biological tradition. These can involve discovery-based approaches, active labs, and atypical mathematical content. The *Biocalculus* texts are designed to provide flexibility for accommodating these diverse needs.

- The main exposition of each textbook provides the strong backbone required for any course and the material is developed in the context of *genuine life-science applications* that are current and topical.
- There are **24 extended projects** that can be used in a variety of ways including group work or weekly active labs. These projects are chosen to be biologically meaningful and to illustrate a breadth of applications. They include examples from bioinformatics and high-dimensional data, epidemiology, ecology, biomechanics, molecular biology, surgery, bioeconomics, game theory, physiology, behavioral ecology, vaccination, anatomy, sports medicine, pharmacology, and biophysics to name a few.
- **Extensive ancillary materials** are posted on the book website under the heading Biology Background (stewartcalculus.com). Each set of materials is associated with an Example, Exercise, or Project of the textbook (marked with "BB"). These resources provide the opportunity to go much more deeply into the biology. Many involve downloadable data from the literature that can be used in class or in labs and tutorials to motivate the associated mathematical concepts. Content also includes animations and videos.
- **Case studies** are provided in the textbook and additional ones will be posted on the book website. These provide another resource that might be used in less traditional course designs. Each case study is an extensive real-world application requiring several different mathematical skills. Each is made up of 4-5 components, with each component tied to a particular mathematical concept. The exposition of each case study is more focused on modeling, and addresses how one translates biology into mathematics and vice versa.

Conceptual Exercises foster conceptual understanding through the problems that you assign. Some exercise sets begin with requests to explain the meanings of the basic concepts of the section. Similarly, all the review sections begin with a Concept Check and a True-False Quiz. Other exercises test conceptual understanding through graphs or tables. Another type of exercise uses verbal description to test conceptual understanding.

Continued on next page

Chapter 5 REVIEW

CONCEPT CHECK

- Write an expression for a Riemann sum of a function f . Explain the meaning of the notation that you use.
 - If $f(x) = 0$, what is the geometric interpretation of a Riemann sum? Illustrate with a diagram.
 - If $f(x)$ takes on both positive and negative values, what is the geometric interpretation of a Riemann sum? Illustrate with a diagram.
- Write the definition of the definite integral of a continuous function from a to b .
 - What is the geometric interpretation of $\int_a^b f(x) dx$ if $f(x) \geq 0$?
 - What is the geometric interpretation of $\int_a^b f(x) dx$ if $f(x)$ takes on both positive and negative values? Illustrate with a diagram.
- State the Midpoint Rule.
- State the Evaluation Theorem. State the Net Change Theorem.
- If $f(x)$ is the rate of growth of a population at time x , where x is measured in months, what does $\int_0^{12} f(x) dx$ represent? Explain the meaning of the definite integral $\int_a^b f(x) dx$. What is the connection between the definite integral $\int_a^b f(x) dx$ and the indefinite integral $\int f(x) dx$?
- State both parts of the Fundamental Theorem of Calculus.
- State the Substitution Rule.
 - State the rule for u as you see it?
- Define the following:
 - antiderivative
 - indefinite integral
- Explain exactly what differentiation and integration are.
 - State the Chain Rule.

TRUE-FALSE QUIZ

Determine whether the statements are true or false. If it is true, explain why. If it is false, explain why or give an example that disproves the statement.

- If f and g are continuous on $[a, b]$, then $\int_a^b (f(x) + g(x)) dx = \int_a^b f(x) dx + \int_a^b g(x) dx$.
- If f and g are continuous, $\int_a^b f(x) dx = \int_a^b g(x) dx$ implies $f(x) = g(x)$.
- If f and g are continuous, $\int_a^b f(x) dx = \int_a^b g(x) dx$ implies $f(x) = g(x)$.

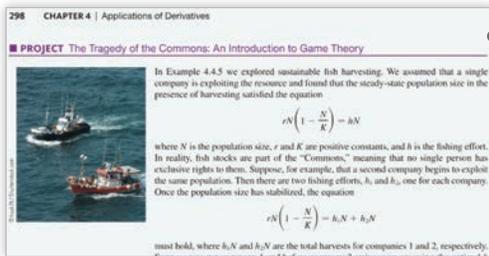
12. Niche overlap The extent to which species compete for resources is often measured by the *niche overlap*. If the horizontal axis represents a continuum of different resource types (for example, seed sizes for certain bird species), then a plot of the degree of preference for these resources is called a species' *niche*. The degree of overlap of two species' niches is then a measure of the extent to which they compete for resources. The niche overlap for a species is the fraction of the area under its preference curve that is also under the other species' curve. The niches displayed in the figure are given by

$$n_1(x) = (x - 1)(3 - x) \quad 1 \leq x \leq 3$$

$$n_2(x) = (x - 2)(4 - x) \quad 2 \leq x \leq 4$$

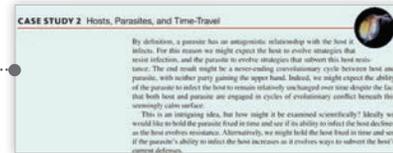
Estimate the niche overlap for species 1 using midpoints. (Choose the number of subintervals yourself.)





Projects involve the students and make them active learners by giving them a feeling of substantial accomplishment when completed. This text provides 24 projects.

Two Case Studies are included: Kill Curves and Antibiotic Effectiveness; and Host, Parasites, and Time Travel. These are extended real-world applications from the primary literature that are more involved than the projects and tie together multiple mathematical ideas throughout the book.



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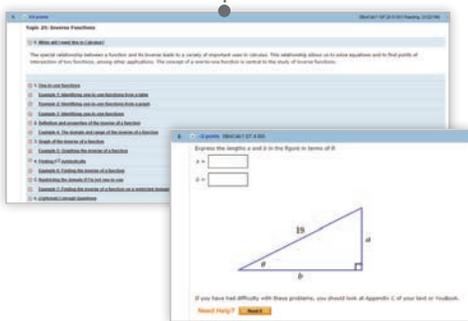
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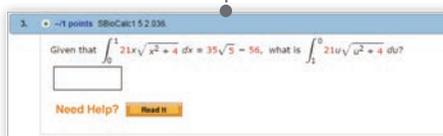
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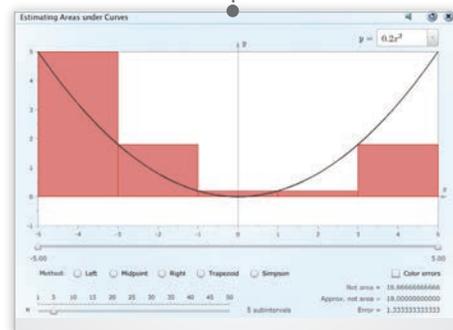
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