



UNIVERSITY OF JORDAN
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Introduction to MATLAB 7 for Engineers

William J. Palm III

Chapter 8 Numerical Calculus and Differential Equations



7-4-4

7-4-4

The area A under the curve of $f(x)$ from $x=a$ to $x=b$.
Figure 8.1-1

$$A = \int_a^b f(x) dx$$

Find the following
integral:

$$A = \int \sin(x^2) dx \quad \text{Fresnel's cosine integral}$$

8-2

8-2

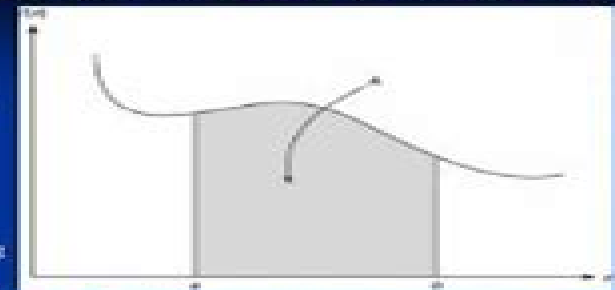
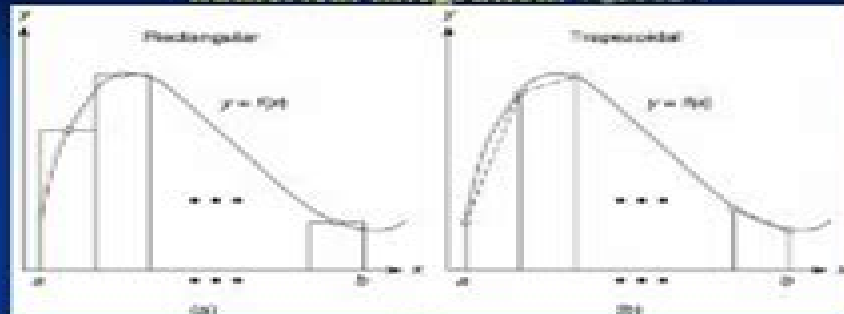


Illustration of (a) Rectangular and (b) Trapezoidal
numerical integration. Figure 8.2-1



8-3

8-3

Numerical integration functions. Table 8.2-1

Command	Description
<code>quad('fun',a,b,tol)</code>	Uses an adaptive Simpson's rule to compute the integral of the function "fun" with a as the lower integration limit and b as the upper limit. The parameter tol is optional. tol indicates the specified error tolerance.
<code>quadl('fun',a,b,tol)</code>	Uses Lobatto quadrature to compute the integral of the function "fun". The rest of the syntax is identical to quad.
<code>trapz(x,y)</code>	Uses trapezoidal integration to compute the integral of y with respect to x, where the array y contains the function values at the points contained in the array x.

8-4

8-4

MATLAB function `quad` implements an adaptive version of Simpson's rule, while the `quadl` function is based on an adaptive Lobatto integration algorithm. To compute the sine integral, type:

```
>> A = quad('sin',0,pi)
```

The answer given by MATLAB is 2, which is correct. We use `quadl` the same way; namely,

```
>> A = quadl('sin',0,pi).
```

Integration example: Create the function:

```
function c2 = cosxq(x)
```

```
% cosine x squared function Fresnel's int.
```

```
c2 = cos(x.^2);
```

Now that you `must` use array exponentiation (`.^`).

The `quad` function is called as follows:

```
>> quad('cosxq',0,sqrt(2*pi))
```

The result is 0.6119.

8-5

8-5

A potential problem with integration.

A function having a singularity at $x=1$. Figure 8.1-2

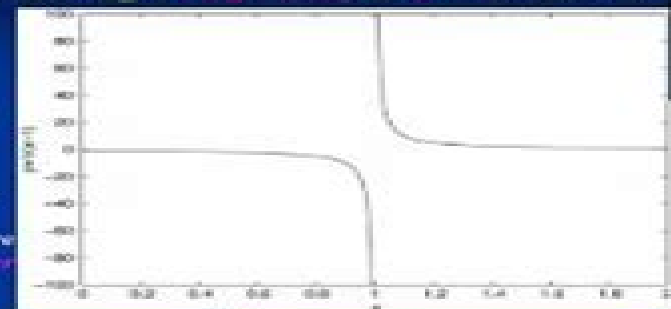
The plot of
 $y = 1/(x-1)$

$$\int \frac{1}{x-1} dx = \ln|x-1|$$

Some integrals
have infinite
values. These are
called *improper
integrals*.

8-6

8-6



Matlab 7 For Engineers

L Darling-Hammond



Matlab 7 For Engineers:

Introduction to MATLAB 7 for Engineers William John Palm, 2005 This is a simple concise book designed to be useful for beginners and to be kept as a reference MATLAB is presently a globally available standard computational tool for engineers and scientists The terminology syntax and the use of the programming language are well defined and the organization of the material makes it easy to locate information and navigate through the textbook The text covers all the major capabilities of MATLAB that are useful for beginning students An instructor's manual and other web resources are available

Introduction to MATLAB for Engineers William John Palm, 1997 Drawing on his teaching of the MATLAB computing environment to college freshmen Palm U of Rhode Island introduces the basics of this user friendly language for numerical analysis visualization and symbolic manipulation that is becoming a standard in a growing number of engineering fields Includes examples of applications and exercises which assume no prior programming experience and a master guide to covered commands and functions Lacks references Annotation copyrighted by Book News Inc Portland OR MATLAB Programming for Engineers Stephen J. Chapman, 2004 Emphasising problem solving throughout this successful title introduces the MATLAB language and shows how to use it to solve typical technical problems It demonstrates how to write clean efficient and well documented programs and how to locate any desired function with MATLAB's online help facilities

Engineering System Dynamics Forbes T. Brown, 2006-08-15 For today's students learning to model the dynamics of complex systems is increasingly important across nearly all engineering disciplines First published in 2001 Forbes T Brown's Engineering System Dynamics A Unified Graph Centered Approach introduced students to a unique and highly successful approach to modeling system dynamics using bond graph **Efficient MATLAB 7 for Engineers** Eric Carlson, 2005 This book provides a thorough overview for MATLAB 7 and a rigorous introduction to engineering problem solving The book's applications firmly relate to traditional engineering science applications with in depth studies of statics dynamics circuits and fluid flow Additionally the book covers introductory numerical solution of ordinary differential equations with MATLAB provides advanced drawing visualization concepts and presents the use of MATLAB sparse matrix routines for solution of basic partial differential equations **Getting Started With Matlab 7** Rudra Pratap, 2005-09-27 *EBOOK: Fluid*

Mechanics (SI units) White, 2016-02-01 Overview White's *Fluid Mechanics* offers students a clear and comprehensive presentation of the material that demonstrates the progression from physical concepts to engineering applications and helps students quickly see the practical importance of fluid mechanics fundamentals The wide variety of topics gives instructors many options for their course and is a useful resource to students long after graduation The book's unique problem solving approach is presented at the start of the book and carefully integrated in all examples Students can progress from general ones to those involving design multiple steps and computer usage McGraw Hill Education's Connect is also available as an optional add on item Connect is the only integrated learning system that empowers students by continuously adapting to

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Medical Imaging and Informatics Xiaohong Gao,Henning Müller,Martin Loomes,Richard Comley,Shuqian Luo,2008-06-11 This series constitutes a collection of selected papers presented at the International Conference on Medical Imaging and Informatics MIMI2007 held during August 14 16 in Beijing China The conference the second of its kind was funded by the European Commission EC under the Asia IT C programme and was co organized by Middlesex University UK and Capital University of Medical Sciences China The aim of the conference was to initiate links between Asia and Europe and to exchange research results and ideas in the field of medical imaging A wide range of topics were covered during the conference that attracted an audience from 18 countries regions Canada China Finland Greece Hong Kong Italy Japan Korea Libya Macao Malaysia Norway Pakistan Singapore Switzerland Taiwan the United Kingdom and the USA From about 110 submitted papers 50 papers were selected for oral

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First International Symposium on Urban Development: Koya as a Case Study F. M. Khoshnaw,2013-12-16 This book contains papers presented at the International Symposium on Urban Development held in the Kurdistan region of Iraq organised by the Faculty of Engineering at Koya University The Kurdistan region is rich in oil gas mineral resources and underground water However until recently the political and security issues were such that the region was unable to take advantage of those resources Nowadays Kurdistan is emerging as one of the fastest developing areas in the Middle East with its universities playing a major role in this process The aim of the meeting was to focus the research carried out at academic

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A Numerical Primer for the Chemical Engineer Edwin Zondervan, 2014-08-12 Solve Developed Models in a Numerical Fashion Designed as an introduction to numerical methods for students A Numerical Primer for the Chemical Engineer explores the role of models in chemical engineering Combining mathematical correctness model verification with numerical performance model validation this text concentrates on numerical metho

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Modern Control Systems Richard C. Dorf, Robert H. Bishop, 2008 Written to be equally useful for all engineering disciplines this book is organized around the concept of control systems theory as it has been developed in the frequency and time domains It provides coverage of classical control employing root locus design frequency and response design using Bode and Nyquist plots It also covers modern control methods based on state variable models including pole placement design techniques with full state feedback controllers and full state observers The book covers several important topics including robust control systems and system sensitivity state variable models controllability and observability computer control systems internal model control robust PID controllers and computer aided design and analysis For all types of engineers who are interested in a solid introduction to control systems

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Introduction To Numerical Computation, An (Second Edition) Wen Shen, 2019-08-28 This book serves as a set of lecture notes for a senior undergraduate level course on the introduction to numerical computation which was developed through 4 semesters of teaching the course over 10 years The book requires minimum background knowledge from the students including only a three semester of calculus and a bit on matrices The book covers many of the introductory topics for a first course in numerical computation which fits in the short time frame of a semester course Topics range from polynomial approximations and interpolation to numerical methods for ODEs and PDEs Emphasis was made more on algorithm development basic mathematical ideas behind the algorithms and the implementation in Matlab The book is supplemented by two sets of videos available through the author s YouTube channel Homework problem sets are provided for each chapter and complete answer sets are available for instructors upon request The second edition contains a set of selected advanced topics written in a self contained manner suitable for self learning or as additional material for an honored version of the course Videos are also available for these added topics

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