



UNIVERSITY OF JORDAN
Faculty of Eng. and Tech.
Electrical Engineering Dept.

Instructor: Ziad H. Al-Khadib



Introduction to MATLAB 7 for Engineers

William J. Palm III

Chapter 8 Numerical Calculus and Differential Equations



8-1

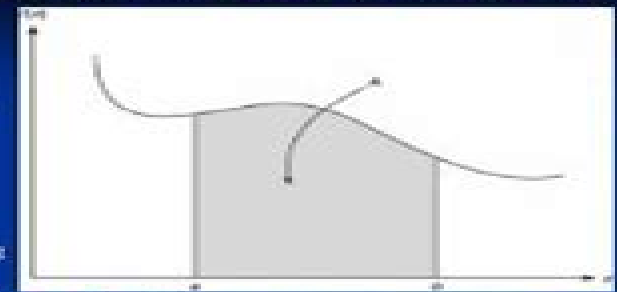
The area A under the curve of $f(x)$ from $x=a$ to $x=b$.
Figure 8.1-1

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

Find the following
integral:

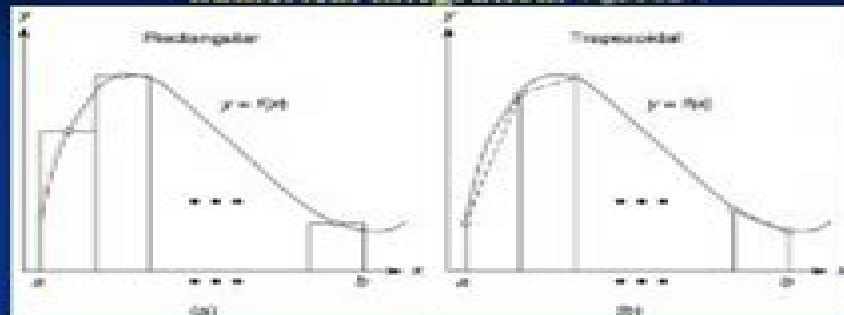
$$A = \int \sin(x^2) dx \quad \text{Fresnel's cosine integral}$$

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8-3

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



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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.

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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 = cosxsq(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('cosxsq',0,sqrt(2*pi))
```

The result is 0.6119.

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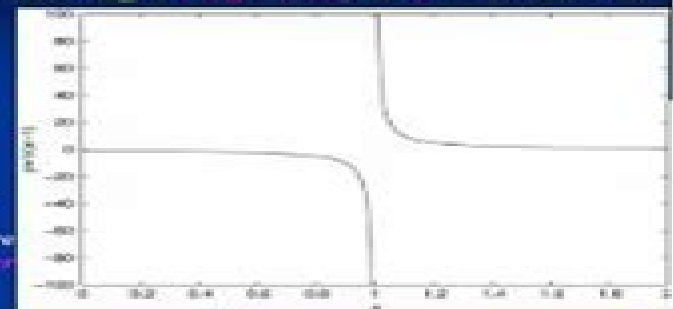
A potential problem with integration.

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 **extreme**
values. These are
called **improper**
integrals.



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8-11

Matlab 7 For Engineers

Jiyuan Zhang



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

Getting Started With Matlab 7 Rudra Pratap, 2005-09-27 *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 graphs Updated with nearly one third new material this second edition expands this approach to an even broader range of topics What's New in the Second Edition In addition to new material this edition was restructured to build students competence in traditional linear mathematical methods before they have gone too far into the modeling that still plays a pivotal role New topics include magnetic circuits and motors including simulation with magnetic hysteresis extensive new material on the modeling analysis and simulation of distributed parameter systems kinetic energy in thermodynamic systems and Lagrangian and Hamiltonian methods MATLAB figures prominently in this edition as well with code available for download from the Internet This code includes simulations for problems that appear in the later chapters as well as code for selected thermodynamic substances Using a step by step pedagogy accompanied by abundant examples graphs illustrations case studies guided exercises and homework problems *Engineering System Dynamics A Unified Graph Centered Approach Second Edition* is a text that students will embrace and continue to use well into their careers While the first half of the book is ideal for junior level undergraduates the entire contents are suited for more advanced students *EBOOK: Fluid Mechanics (SI units)* White, 2016-02-01 Overview White's *Fluid Mechanics* offers students a clear and comprehensive

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Experimental and Numerical Investigation of Advanced Materials and Structures Andreas Öchsner, Holm Altenbach, 2013-08-13 The idea of this monograph is to present the latest results related to experimental and numerical investigations of advanced materials and structures The contributions cover the field of mechanical civil and materials engineering ranging from new modelling and simulation techniques advanced analysis techniques optimization of structures and materials and constitutive modelling Well known experts present their research on damage and fracture of material and structures materials modelling and evaluation up to image processing and visualization for advanced analyses and evaluation

International Advanced Researches & Engineering Congress 2017 Proceeding Book Recep HALICIOGLU, Hediye KIRLI AKIN, Yusuf FEDAI, 2017-12-29

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