

Calculus Technologies, First Semester

College of Staten Island, CUNY

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CD stands for “Calculus DeMYSTiFieD”, LHE stands for “Calculus”, by Larson & Hostetler & Edwards. Section numbers are given in parentheses. Note that the assignment, for example, “Read CD(2.1,2.2)” means to read sections 2.1 and 2.2 of Calculus Demystified **and** to complete the 5 problems labeled “you try it” contained in those sections.

0.1 The Idea of Limit

Graphical and numerical interpretations of limits. One-sided limits.

1. Read CD(2.1,2.2) or LHE(1.2, examples 1,2,3,4)
2. Handwrite solutions to You Try It problems and CD(page 78): #1
3. Skim LHE(1.2, examples 1,2,3,4)
4. Webwork assignment

0.2 The Calculation of Limits

Requires *The Idea of Limit*. Algebraic manipulations that help compute limits.

1. Read LHE(1.3, entire section)
2. Webwork assignment

0.3 The Idea of Continuity

Requires *The Calculation of Limits*. Definition of continuous and examples. Closure of continuity under addition and multiplication.

1. Read CD(2.3) or LHE(1.4, subsections “Continuity at a Point” and “Properties of Continuity”)
2. Handwrite solutions to You Try It problems and CD(page 79): #2
3. Webwork assignment

0.4 The Definition of the Derivative

Requires *The Calculation of Limits*. The definition of derivative and its application to quadratics.

1. Read CD(2.4) or LHE(2.1)
2. Handwrite solutions to You Try It problems and CD(page 79): #3
3. Skim LHE(2.1) (you will study tangent lines in detail later)
4. Webwork assignment

0.5 The Calculation of Derivatives

Requires *The Definition of the Derivative*. This is a keystone technology and should be completed as quickly as possible. Includes the product, quotient, power, and chain rules, and the derivatives of polynomials, exponentials, natural logarithms, trig and inverse trig functions, and the derivative of an inverse function.

1. Read CD(2.5) or LHE(2.2, 2.3) and skim LHE(2.4)
2. Handwrite solutions to You Try It problems and CD(page 79–80): #4, 6, 8
3. Webwork assignment

0.6 The Derivative as a Rate of Change

Requires *The Definition of the Derivative*. Covers $s(t) = -16t^2 + v_0t + s_0$.

1. Read CD(2.6) or LHE(2.2, pp 113-4)
2. Handwrite solutions to You Try It problems and CD(page 80): #5, 7
3. Webwork assignment

0.7 Implicit Differentiation

Requires *The Calculation of Derivatives*. Implicitly defined functions and their derivatives.

1. Read LHE(2.5)
2. Webwork assignment

0.8 The Graphing of Functions

Requires *The Calculation of Derivatives*. The effect of the first and second derivatives on the graph of a function.

1. Read CD(3.1) or LHE(3.3,3.4)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.9 The Solution of Max/Min Problems

Requires *The Derivative as a Rate of Change* and *The Calculation of Derivatives*. Finding local maxima and minima from formulas and from word problems.

1. Read CD(3.2) or LHE(3.1)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.10 The Calculation of Related Rates

Requires *The Derivative as a Rate of Change* and *The Calculation of Derivatives*.

1. Read CD(3.3) or LHE(2.6)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.11 Falling Bodies

Requires *The Derivative as a Rate of Change*.

1. Read CD(3.4) or LHE(2.2, Rates of Change subsection)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.12 The Line Tangent to a Function's Graph

Requires *The Calculation of Derivatives*.

1. Read LHE(2.1). Also helpful is that in LHE(9.7, examples 1 through 7), the polynomial $P_1(x)$ is the tangent line.
2. Webwork assignment

0.13 The Usage of Infinity

Requires *The Calculation of Derivatives*. limits that are infinite, limits as $x \rightarrow \infty$, l'Hôpital's Rule

1. Read CD(5.1,5.2) or LHE(8.7). Also, LHE(1.5,3.5) has some useful examples.
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.14 More Optimization Problems

1. Consult LHE(3.7) as needed
2. Webwork assignment

0.15 Newton's Method

1. Read LHE(3.8) or Matlab project 8
2. Webwork assignment

0.16 Differentials

1. Read LHE(3.9)
2. Webwork assignment

Review for Second Exam

The most important applications are max/min problems, optimizations problems, Newton's Method, and l'Hôpital's Rule.

1. Webwork assignment, including CD(Chap 3 exercises on page 97–98) and CD(page 145): #1, 2, 3

0.17 The Idea of Antiderivatives

Requires *The Calculation of Derivatives*.

1. Read CD(4.0,4.1) or LHE(4.1)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.18 Riemann Sums and Area

Requires *The Idea of Antiderivatives*. Riemann sums, and indefinite integrals

1. Read CD(4.2)
2. Handwrite solutions to You Try It problems
3. Read LHE(4.2,4.3,4.4)
4. Webwork assignment

0.19 Signed Area

Requires *Riemann Sums and Area*.

1. Read CD(4.3) and LHE(4.2,4.3,4.4)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.20 The Area Between Curves

Requires *Signed Area*.

1. Read CD(4.4) or LHE(7.1)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.21 The Linearity of Integration

This technology is a consolidation of the integration so far. Requires *The Area Between Curves*.

1. Read CD(4.5) or LHE(page 520: rules 1 and 2; page 276)
2. Webwork assignment

Review for Third Exam

1. Handwrite solutions to CD(exercises, page 120)
2. Webwork assignment

0.22 The Natural Logarithm as an Integral

Requires *The Linearity of Integration*

1. Read CD(6.1) or LHE(5.1,5.2)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.23 The Exponential Function

Requires *The Linearity of Integration*

1. Read CD(6.2) or LHE(5.4)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.24 Other Bases and Logarithmic Differentiation

Requires *The Linearity of Integration*

1. Read CD(6.3,6.4) or LHE(5.5)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.25 Differential Equations

growth and decay problems. Requires *Other Bases and Logarithmic Differentiation* and *The Exponential Function*.

1. Read CD(6.5) or LHE(6.2)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

0.26 Inverse Functions

Requires *Other Bases and Logarithmic Differentiation* and *The Exponential Function*.

1. Read CD(6.6) or LHE(5.3)
2. Handwrite solutions to You Try It problems
3. Webwork assignment

Review for Fourth Exam

You should be able to handle derivatives and integrals of logarithms and exponentials to any positive base, and to solve first-order differential equations.

1. Webwork assignment