

## Math 103 Introduction to Calculus.

Introduction to concepts and methods of calculus for students with little or no previous calculus experience. Polynomial and elementary transcendental functions and their applications, derivatives, extremum problems, curve-sketching, approximations; integrals and the fundamental theorem of calculus.

**Text:** *Thomas' Calculus Early Transcendentals Custom Edition for the University of Pennsylvania* Pearson 2012. Package ISBN : 978-1-256-82329-2

Section	Title	Core Problems
1.1	Functions and Their Graphs	3, 7, 42, 25, 65, 53, 60, 62, 66.
1.2	Combining Functions; Shifting and Scaling Graphs	3, 7, 42, 25, 53, 65.
1.3	Trigonometric Functions	6, 17, 23, 42, 49.
1.4	Graphing with Calculators and Computers	1, 7, 31, 27.
1.5	Exponential Functions	1, 8, 15, 29, 34, 36.
1.6	Inverse Functions and Logarithms	1, 3, 15, 17, 21, 26, 40(a), 49, 55, 65, 78.
2.1	Rates of Change and Tangent Curves	2, 7, 15, 20.
2.2 + start of 2.4	Limit of a Function, Limit Laws and One-Sided Limits	Section 2.2: 1, 4, 12, 31, 53, 63, 79. Section 2.4: 1, 5, 15, 21.
Optional:2.3 + end of 2.4	The Precise Definition of a Limit	Section 2.3: 7, 15, 32, 49. Section 2.4: 47, 49.
2.5	Continuity	2, 13, 32, 45, 64.
2.6	Limits Involving Infinity	2, 5, 10, 17, 25, 39, 60, 81, 99.
3.1	Tangents and the Derivative at a Point	3, 9, 16, 22, 27, 33, 35.
3.2	The Derivative as a Function	1, 7, 15, 21, 30, 31, 35, 38, 45.
3.3	Differentiation Rules	11, 24, 37, 42, 53, 60, 65, 67, 77.
3.4	The Derivative as a Rate of Change	5, 14, 18, 24, 25.
3.5	Derivatives of Trigonometric Functions	3, 12, 26, 37, 61, 41, 54.
3.6	The Chain Rule	6, 14, 16, 34, 41, 70, 72, 84, 87, 93.
3.7	Implicit Differentiation	5, 23, 32, 43, 47, 51.
3.8	Derivatives of Inverse Functions and Logarithms	3, 13, 43, 56, 94.
3.9	Inverse Trigonometric Functions	1, 9, 14, 27, 43, 48, 53.
3.10	Related Rates	12, 15, 23, 35, 39, 44.
3.11	Linearization and Differentials	1, 13, 20, 43, 49, 51, 61.

<b>Section</b>	<b>Title</b>	<b>Core Problems</b>
4.1	Extreme Value of Functions	6, 21, 47, 61, 76, 83.
4.2	The Mean Value Theorem	2, 12, 21, 31, 33, 44, 51, 56, 67.
4.3	Monotonic Functions and the First Derivative Test	7, 16, 37, 47, 60, 70, 81.
4.4	Concavity and Curve Sketching	1, 11, 48, 61, 83, 87, 103, 107, 109, 114, 117.
4.5	Indeterminate Forms and L'Hopital's Rule	1, 7, 34, 51, 68, 78(a), 85.
4.6	Applied Optimization	1, 3, 8, 11, 15, 17, 20, 23, 26, 37, 42, 46, 49, 50, 59, 64.
4.7	Newton's Method	1, 8, 9, 12, 24, 28.
4.8	Antiderivatives	1, 12, 25, 33, 65, 72, 84, 90, 95, 115, 120, 122, 126.
5.1	Area and Estimating with Finite Sums	1, 5, 10, 12, 13, 17, 20.
5.2	Sigma Notation and Limits of Finite Sums	1, 8, 11, 17, 21, 33, 39.
5.3	The Definite Integral	2, 8, 15, 29, 42, 51, 65, 71, 82, 85.
5.4	The Fundamental Theorem of Calculus	1, 27, 36, 39, 54, 61, 65, 71, 73, 76, 83
5.5	Indefinite Integrals and the Substitution Method	3, 9, 17, 42, 68, 71, 77.
5.6	Substitution and Area Between Curves	1, 11, 22, 38, 47, 58, 69, 81, 101, 111.
7.1	The Logarithm Defined as an Integral	1, 10, 47, 55, 60, 63, 70.
7.3	Hyperbolic Functions	1, 13, 25, 37, 41, 62, 77, 81, 83, 86.

SAMPLE EXAM QUESTIONS (available from the Math Dept's Math 103 Web Page: <http://www.math.upenn.edu/ugrad/calc/m103/>) also form a part of the core.

The core problems indicate the kind of basic problems you will need to be able to solve by hand. They also provide a guide to the basic level of difficulty to be expected on the final exam.

Note: All sections of Math 103 have a COMMON FINAL EXAM