# NEW YORK CITY COLLEGE OF TECHNOLOGY
# The City University of New York

**DEPARTMENT:** Mathematics

**COURSE:** MAT 1575

**TITLE:** Calculus II

**DESCRIPTION:** A continuation of MAT 1475. Topics include Taylor polynomials, Mean Value Theorem, Taylor and Maclaurin series, tests of convergence, techniques of integration, improper integrals, areas, volumes and arc lengths.

**TEXT:** E. Herman and G. Strang
Calculus Volume 1, OpenStax, Rice University, Houston Texas USA 2017
Calculus Volume 2, OpenStax, Rice University, Houston Texas USA 2017.

**CREDITS:** 4

**PREREQUISITE:** MAT 1475

Prepared by:
Prof. Neil Katz
Prof. Arnavaz Taraporevala
Prof. Henry Africk
Prof. Kate Poirier
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A. Testing Guidelines:
The following exams should be scheduled:
1. A one-hour exam at the end of the First Quarter.
2. A one session exam at the end of the Second Quarter.
3. A one-hour exam at the end of the Third Quarter.
4. A one session Final Examination.

B. A graphing calculator is required.

**Course-Based Learning Outcomes and Alignment with General Education Goals**

Upon satisfactory completion of this course, the student will be able to:

| MAT 1575 | NYCCT Gen Ed Common Core | CUNY Common Core |
|---|---|---|
| Gather, interpret, and assess information about calculus from the textbook, other written sources, an instructor and other informed individuals. | Think creatively, critically, analyze data, develop quantitative and information literacy. | Gather, interpret, and assess information from a variety of sources and points of view. |
| Use algebraic, numerical and graphical methods to draw conclusions and solve mathematical problems. | Think critically, analyze data, develop quantitative reading and writing skills, | Evaluate evidence and arguments critically or analytically. |
| Produce well-reasoned written or oral arguments using evidence to support conclusions in mathematics. | Think creatively, critically, analyze data, develop quantitative reading and writing skills. | Produce well-reasoned written or oral arguments using evidence to support conclusions. |
| Identify and apply the fundamental concepts and methods of calculus and apply them to the biological, physical and social sciences. | Think creatively, critically, and apply quantitative knowledge to the acquisition of interdisciplinary and intercultural knowledge. | Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the scientific world, including, but not limited to: computer science, history of science, life and physical sciences, linguistics, logic, mathematics, psychology, statistics, and technology-related studies. |
| Use the tools of calculus to analyze problems in other areas of mathematics, science and society and develop solutions. | Acquire the skills for lifelong learning and information literacy, inquiry and analysis. s. Develop quantitative reading and writing skills. | Demonstrate how tools of science, mathematics, technology, or formal analysis can be used to analyze problems and develop solutions. |

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| Use the methods of calculus to articulate and evaluate the evidence supporting theories in the physical, biological, and social sciences<br>. | Develop the creative and critical thinking skills to communicate interdisciplinary and intercultural knowledge. | Articulate and evaluate the empirical evidence supporting a scientific or formal theory. |

## Course Intended Learning Outcomes/Assessment Methods

| Learning Outcomes | Assessment Methods |
|---|---|
| **1.** Find anti-derivatives using integration by parts, trigonometric substitution, and the technique of partial fractions. | Classroom activities and discussion, homework, exams. |
| **2.** Apply knowledge of integration to calculate volumes of solids of revolution, areas, and arc lengths. | Classroom activities and discussion, homework, exams. |
| **3.** Evaluate improper integrals. | Classroom activities and discussion, homework, exams. |
| **4.** Find Taylor polynomials and use Taylor's Theorem to estimate error. | Classroom activities and discussion, homework, exams. |
| **5.** Construct infinite series and test for their convergence and divergence. | Classroom activities and discussion, homework, exams. |

## General Education Learning Outcomes/Assessment Methods

| Learning Outcomes | Assessment Methods |
|---|---|
| **1.** Understand and employ both quantitative and qualitative analysis to solve problems. | Classroom activities and discussion, homework, exams. |
| **2.** Employ scientific reasoning and logical thinking. | Classroom activities and discussion, homework, exams. |
| **3.** Communicate effectively using written and oral means. | Classroom activities and discussion, homework, exams. |
| **4.** Use creativity to solve problems. | Classroom activities and discussion, homework, exams. |

# New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**MAT 1575** Calculus II **Text**: E.Herman & G.Strang, Calculus Volume 1&2 OpenStax

| Session | Topic | Homework | WeBWorK |
|---|---|---|---|
| 1 | **4.10** Antiderivatives (p. 485 – 496) **[Volume 1]** | **P. 497:** 465, 470, 471, 476, 477, 481, 484, 490, 492, 493, 495, 496, 499, 500, 501 | Review-PowerRule<br>Review-ProductRule<br>Review-QuotientRule<br>Review-ChainRule<br>Integration – Antiderivatives |
| 2 | **1.2** The Definite Integral (p. 27 – 39)<br>**1.3** The Fundamental Theorem of Calculus (p. 50 – 57) | **P. 42:** 71, 73, 75, 76, 77, 80, 88, 89, 90, 92<br>**P. 60:** 170, 171, 172, 182, 183, 184, 187 | Integration – Definite Integrals<br>Integration – Fundamental Theorem constant bounds<br>Integration – Fundamental Theorem variable bounds |
| 3 | **1.5** Substitution (p. 82 – 89)<br>**1.6** Integrals Involving Exponential and Logarithmic Functions (p. 94 – 96, 98 - 102) | **P. 90:** 256, 258, 261, 265, 271, 273, 275, 276, 292, 293<br>**P. 103:** 320, 321, 322, 325, 327, 328, 330, 332, 335, 337, 338, 355 – 363 all | Integration – Substitution<br>Integration – Exponential and Logarithmic |
| 4 | **3.1** Integration by Parts (p. 261 – 268) | **P. 270:** 7, 8, 13, 15, 16, 19, 20, 27, 31, 38, 42, 43, 45 | Integration – Integration by Parts |
| 5 | **3.2** Trigonometric Integrals (p. 273 – 282) | **P. 283:** 73, 74, 78 – 85 all, 91, 97, 98, 100 | Integration – Trigonometric Integrals |
| 6 | **3.3** Trigonometric Substitution (p. 285 – 293) | **P. 296:** 126, 128, 135 – 143 odd, 147 – 153 odd | Integration – Inverse Trigonometric Result |
| 7 | **3.3** Trigonometric Substitution (continued)<br>[cover problems #132 on p. 196 and #164 on p. 297] | **P. 296:** 131, 133, 134, 160 – 163 all, 164 | Integration – Trigonometric Substitution |
| 8 | **First Examination** | | |

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| 9 | **3.4** Partial Fraction Decomposition (p. 298 – 303) | **P. 308:** 183, 185, 187, 196, 197, 199, 200 – 204 all | |
| 10 | **3.4** Partial Fraction Decomposition (cont.) (p. 303 – 306) | **P. 308:** 189, 198, 205, 206, 207, 209 – 212 all, 215, 217 | Integration – Partial Fractions |
| 11 | **3.7** Improper Integration (p. 330 – 340) | **P. 343:** 347 – 373 odd | Integration – Improper Integrals |
| 12 | **6.3** Taylor and Maclaurin Polynomials (p.562--567) | **P. 578**: 118—123 all | |
| 13 | **6.3** Taylor and Maclaurin Polynomials (continued) (p.567--573) | **P. 578**: 125, 127, 28, 133, 135 | Series – Taylor and Maclaurin Polynomials |
| 14 | **Midterm Examination** | | |
| 15 | **5.1** Sequences (p.427--444) | **P. 447**: 1, 3, 7, 9, 12, 13--15 odd, 23--37 odd, 47--51 odd | Series – Sequences |
| 16 | **5.2** Infinite Series (p.450--459) | **P. 466**: 67--74, 76, 77, 79, 80, 83--85 odd, 89—95 odd | Series – Infinite Series |
| 17 | **5.3** The Divergence and Integral Tests (p.471--478) | **P. 482**: 138, 139--145 odd, 152—155, 158, 159, 161, 163 | Series – Integral Test<br>Series – Divergence Test |
| 18 | **5.4** Comparison Tests (p.485--492) | **P. 493**: 194—197all, 199, 200, 202, 204—206 all, 211<br>(optional: 222-223) | Series – Comparison Tests |
| 19 | **5.5** Alternating Series (p.496--502) | **P. 505**: 250--257 all, 261—264 all, 266, 267 | Series – Alternating Series |
| 20 | **5.6** Ratio and Root Tests (p.509--519) | **P. 522**: 317--320 all, 323, 325, 328, 329--335 odd, 349, 351 | Series – Ratio and Root Tests |
| 21 | **6.1** Power Series and Functions (p.531--537)<br>**6.2** Properties of Power Series (p.544--548, 552- | **P. 541**: 13-21 odd, 24, 28<br>**P. 558**: 87—90 all, 96, 97 | Series – Power Series |

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| | -557) | | |
| 22 | **6.3** Taylor and Maclaurin Series (p.561--562, 573--576)<br>**6.4** Working with Taylor Series (p.584--587, 590--592) | **P. 578**: 118-123 all, 140—147 all, 151—155 all<br>**P. 596**: 203, 206, 207, 209, 219--223 odd | Series – Taylor and Maclaurin Series |
| 23 | **Third Examination** | | |
| 24 | **1.1** Approximating Areas (p. 5 – 20) | **P. 21**: 1 – 7 odd, 12, 15, 16, 17 | Applications – Approximation of Area |
| 25 | **2.1** Areas Between Two Curves (p. 122 – 128) | **P. 131**: 1 – 7 all, 11, 15 – 21 all, 23<br>**P. 271**: 63 | Applications – Area Between Curves |
| 26 | **2.2** Determining Volumes by Slicing (p. 141 – 149) | **P. 150**: 58, 59, 74 – 80 all, 98 – 102 all<br>Find the volume of the solid obtained by rotating the region bounded by the curves $y = x^2$, $y = 12-x$, $x = 0$ and $x \geq 0$<br>about (a) the x–axis; (b) the line $y = -2$; (c) the line $y = 15$;<br>(d) the y-axis; (e) the line $x = -5$; (f) the line $x = 7$. | Applications – Volumes by Slicing |
| 27 | **2.3** Volumes of Revolution: Cylindrical Shells (p. 156 – 165) | **P. 166**: 120 – 131 all, 140-143 all, 145, 148, 158, 159<br>**P. 271**: 61 | Applications – Volumes of Revolution |
| 28 | **2.4** Arc Length of a Curve and Surface Area (p. 169 – 179) | **P. 180**: 165, 166, 171, 173, 174, 176, 177, 191, 192<br>**P. 284**: 119 | Applications – Arc Length<br>Application – Surface Area |
| 29 | **Review** | | |
| 30 | **Final Examination** | | |