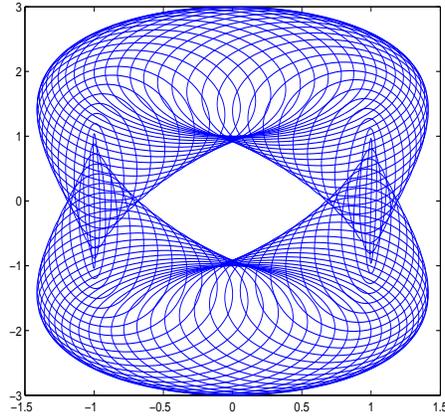


Student Handbook for MATH 2301



“If you stop at general math, you’re only going to make general math money.” - Snoop Dogg
“If I am anything, I have made myself so by hard work.” - Sir Isaac Newton

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Course Web Site: <https://www.ohio.edu/cas/math/undergrad/courses-resources/calculus.cfm>

OU Matlab Page: <https://www.ohio.edu/cas/math/undergrad/courses-resources/matlab/index.cfm>

1 General Information

Welcome to MATH 2301 Calculus I at Ohio University! Calculus is one of the gems of the intellectual achievements of humankind. We hope that taking calculus in our department will be an exciting and rewarding experience. Let's begin with some basics:

In Class:

Your instructor will be either a faculty member (professor) or a well-trained teaching assistant (TA). You can expect much of class time to be devoted to lectures but many instructors also employ in-class group work and other teaching techniques.

Recitation:

Your recitation will be led by a TA. It will consist of some combination of explanation of homework problems, group work and quizzes.

Outside of Class:

On Page 6 is a list of assigned homework problems. Your instructor may or may not require you to turn them in, but it is up to you to do them anyway.

Exams:

The usual exam format is two midterms and a final, although some instructors use other formats of exams and/or quizzes. There will be a common final exam that is based on the assigned homework. The best way to prepare for the final is to do and understand all the homework. There are sample final exams at the course web site. No calculators of any kind will be allowed on exams.

Grade Policy:

Grading systems are determined by individual instructors. You must earn a grade of at least C to take the next class in the sequence.

Office Hours:

Your instructor will have office hours which are meant to be used by you to get help. Office hours are free tutoring by the best tutor for the class. Do not miss out on this resource.

Student Accessibility:

If you have specific physical, psychiatric, or learning disabilities and require accommodations, please let your instructor know as soon as possible so that your learning needs may be appropriately met. You should also register with Student Accessibility Services to obtain written documentation and to learn about the resources they have available.

Academic Integrity:

Online Homework: The online homework must be done by you, but you may use any help that you can find. Keep in mind that the purpose of the homework is to develop your ability to do such problems on your own.

Recitation Groupwork: If your group receives any help specifically on the problem you are trying to solve (such as assistance from another group or software that solves the problem), you must acknowledge in writing what help you received and from whom or what source (including internet links). (You do not need to acknowledge your recitation leader.)

Tests, final exam: You may not give or receive any assistance during a test or the exam, including but not limited to using notes, phones, calculators, computers, or another student's solutions.

Violations may result in a grade penalty on the assignment. Serious or repeated violations will result in failure in the class and be reported to the Office of Community Standards and Student Responsibility, which may impose additional sanctions.

2 Some Advice Before You Start MATH 2301

We hope to do everything possible to help you succeed in Calculus at Ohio University. Before you begin, you should be aware that there are some major differences between math in high school and college: (1) We cover material more quickly than in high school; (2) We study topics in more depth than in high school; (3) Your classmates are better than in high school; (4) You have more responsibility for your own learning than in high school.

Your instructor is responsible for teaching well. You are responsible for learning well. These responsibilities are very different. Your instructor should do everything, within reason, to help you learn, but most learning occurs outside class and requires work on your part. You should *schedule at least 2 hours for work outside of class* for every hour in class.

Always keep in mind that *math is cumulative*. You need to review material from high school. You need to review material from previous classes. You need to review material from previous tests. Keep a precalculus book handy when you study calculus. Many students who perform badly in calculus do so because they have forgotten algebra and trigonometry.

You should always *work, understand and review all the homework*. Math is mostly learned by doing, not by having it explained.

It is best to study by yourself *and* with classmates. A combination of individual and group study is more effective than either alone.

Go to classmates and/or your instructor about things you don't understand. You will usually find that both are very helpful, but only if you ask.

Keep note cards of all the formulas you should have memorized. Be sure to go into tests knowing all the formulas you are supposed to know. Have your roommate or study partners quiz you on the formulas.

Study the mistakes you made on previous tests. Never repeat a mistake.

Here is a good study plan:

1. Skim the book before class.
2. Go to class.
3. Do the homework and read the book.
4. Ask questions.
5. Study.
6. Take test.
7. Review test.

3 Material to know before starting MATH 2301

It is assumed that before taking Calculus, you have had two years of high school algebra, high school geometry and a course that included trigonometry, such as MATH 1300.

Because *math is cumulative*, mastery and review of previous material is essential for your success. Your MATH 2301 instructor will take for granted that you have mastery of the material below. You should always review it before tests. As a general rule you should understand and be able to use all the material and formulas in reference pages 1 - 4 in the inside back cover of the textbook. Below are some specific formulas that you should memorize before each test.

Algebra. Know:

How to factor a polynomial (if it is possible).

How to use the quadratic formula.

How to solve a system of linear equations.

How to complete the square.

$$a(b + c) = ab + ac$$

$$\frac{a + c}{b} = \frac{a}{b} + \frac{c}{b}$$

$$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$$

$$\frac{a/b}{c/d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$$

Caution: $\sqrt{a^2 + b^2} \neq a + b$, $\frac{a + b}{c + d} \neq \frac{a}{c} + \frac{b}{d}$.

$$x^m x^n = x^{m+n}$$

$$(x^m)^n = x^{mn}$$

$$(xy)^n = x^n y^n$$

$$x^{1/n} = \sqrt[n]{x}$$

$$\sqrt[n]{xy} = \sqrt[n]{x} \sqrt[n]{y}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$x^{-n} = \frac{1}{x^n}$$

$$\left(\frac{x}{y}\right)^n$$

$$x^{m/n} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$$

$$x^2 - y^2 = (x + y)(x - y)$$

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

$$(x + y)^2 = x^2 + 2xy + y^2$$

$$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

If $ax^2 + bx + c = 0$ then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Geometry.

Memorize and be able to use the following. See Reference Page 1 of the text for pictures.

Triangle:

$$A = \frac{1}{2}bh$$

Sphere:

$$V = \frac{4}{3}\pi r^3$$

$$A = 4\pi r^2$$

Circle:

$$A = \pi r^2$$

$$C = 2\pi r$$

Cylinder:

$$V = \pi r^2 h$$

Sector of a Circle:

$$A = \frac{1}{2}r^2\theta$$

$$C = r\theta \ (\theta \text{ in radians})$$

Cone:

$$V = \frac{1}{3}\pi r^2 h$$

Trigonometry.

Know the definition of $\sin x$, $\cos x$ and $\tan x$ in terms of right triangles.

Review Reference Page 2 in the back of the textbook.

Understand, memorize and be able to use all formulas below.

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sin(-\theta) = -\sin \theta$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

$$\cos(-\theta) = \cos(\theta)$$

$$\arcsin x = \sin^{-1} x = y \iff \sin y = x \text{ and } -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$$

$$\arccos x = \cos^{-1} x = y \iff \cos y = x \text{ and } 0 \leq y \leq \pi$$

$$\arctan x = \tan^{-1} x = y \iff \tan y = x \text{ and } -\frac{\pi}{2} < y < \frac{\pi}{2}$$

Exponential and Log Functions. Memorize and be able to use the following:

$$\log_a x = y \iff a^y = x$$

$$\ln x = \log_e x$$

$$\ln x = y \iff e^y = x$$

$$\log_a(a^x) = x$$

$$a^{\log_a x} = x$$

$$\ln(e^x) = x$$

$$e^{\ln x} = x$$

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a(x^r) = r \log_a x$$

Functions and Graphs

Review sections 1.1,2 and reference pages 3 and 4.

Memorize the graphs of the functions:

$$x, x^2, x^3, \sqrt{x}, \sqrt[3]{x}, 1/x, 1/x^2, |x|, e^x, \ln x, \sin x, \cos x, \tan x.$$

Know the difference between the Graph of an Equation and the Graph of a Function

Use Translation Principles: $x \mapsto (x - h)$ shifts right by h . $y \mapsto (y - k)$ shifts up by k .

Equation of a line: $y - y_0 = m(x - x_0)$ (point-slope form).

4 WebAssign

Some instructors may use web assign for the course.

Student support for WebAssign can be found at:

http://www.webassign.net/user_support/student/

Accessing WebAssign through Blackboard:

http://www.webassign.net/manual/FDOC/FDOC_bb.ppt

5 Syllabus for 2301

Text: *Essential Calculus with Early Transcendentals*, James Stewart, 2nd edition.

- | | |
|---|--|
| 1.3 – The Limit of a Function | 3.6 – Hyperbolic Functions * |
| 1.4 – Calculating Limits | 3.7 – Indeter. Forms & l’Hospital’s Rule** |
| 1.5 – Continuity | 4.1 – Maximum and Minimum Values |
| 1.6 – Limits involving ∞ | 4.2 – The Mean Value Theorem |
| 2.1 – Derivatives and Rates of Change | 4.3 – Derivatives and the Shape of a Graph |
| 2.2 – The Derivative as a Function | 4.4 – Curve Sketching |
| 2.3 – Basic Differentiation Formulas | 4.5 – Optimization Problems |
| 2.4 – The Product and Quotient Rules | 4.6 – Newton’s Method |
| 2.5 – The Chain Rule | 4.7 – Antiderivatives |
| 2.6 – Implicit Differentiation | 5.1 – Areas and Distances |
| 2.7 – Related Rates | 5.2 – The Definite Integral |
| 2.8 – Linear Approx. & Differentials | 5.3 – Evaluating Definite integrals |
| 3.2 – Inverse Functions and Logarithms | 5.4 – Fundamental Theorem of Calculus |
| 3.3 – Derivatives of Log. & Exp. Funcs. | 5.5 – The Substitution Rule |
| 3.5 – Inverse Trigonometric Functions | |

* Cover \sinh , \cosh , and their derivatives only

** Cover through products. Skip indeterminate differences and powers.

This is a TAGS (Ohio **T**ransfer **A**ssurance **G**uides) course and the above topics follow closely the material prescribed by TAGS.

6 Homework Problems for MATH 2301

Section	Problems
1.3	1-9 odd, 27
1.4	1-41 odd, 49-55 odd
1.5	1-23 odd, 29, 30, 32, 37, 39, 41, 45
1.6	1-6, 13-31 odd, 41, 42, 45, 49
2.1	1-11 odd, 15-18, 37, 39, 43, 45
2.2	1-15 odd, 19-27 odd, 33-36, 39, 41
2.3	1-27 odd, 28, 29-37 odd, 43-57 odd
2.4	3-29 odd, 51, 53, 55
2.5	1-35 odd, 43, 47, 51, 53, 57, 62, 65, 67
2.6	1-23 odd, 32, 43
2.7	1, 2, 3-17 odd, 21-33 odd, 37
2.8	1, 3, 5, 11, 12, 13- 23 odd, 24, 25, 27
3.2	1-25 odd, 31-39 odd, 47-53 odd
3.3	1-37 odd, 41-47 odd, 51- 63 odd
3.4*	1-15 odd, 19
3.5	1-13 odd, 17-27 odd, 34, 35, 37, 39, 40
3.6	1, 3, 9, 27, 28, 29, 31, 34, 35, 47
3.7	1, 5, 9, 13, 17, 21, 25, 41, 43
4.1	7-49 odd
4.2	1-17 odd, 23, 25
4.3	1-11 odd, 10, 15-29 odd, 33, 35, 40, 41
4.4	5-17 odd, 21, 27, 31, 33, 37, 39, 41, 45, 47
4.5	5-17 odd, 16, 21, 25, 27, 29, 33, 36, 43, 45, 47, 54, 56, 58
4.6	1, 3, 5, 6, 7, 8, 9, 11, 12, 17, 21, 23
4.7	1-13 odd, 17-31 odd, 39, 41, 43, 46, 47, 51, 53, 54
5.1	1-15 odd, 19, 21(a)
5.2	1-17 odd, 25, 29, 31, 33, 35, 41
5.3	1-25 odd, 31, 33, 39, 43-49 odd, 53, 55, 59-67 odd
5.4	1-11 odd, 15, 17, 19
5.5	1-21 odd, 22, 23, 27, 29, 30, 34, 37, 41, 43, 49, 50, 53, 61

* Optional, will not be covered on the common final, but it is suggested that you do them for your own benefit.