



Independent Study IN IDAHO

Math 170

Analytic Geometry and Calculus I

Independent Study in Idaho
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The University of Idaho in statewide cooperation with
Boise State University — Idaho State University
Lewis-Clark State College

Study Guide

Independent

Study IN IDAHO

PO Box 443225

Moscow ID 83844-3225

Self-paced study. Anytime. Anywhere!

Mathematics 170 **Analytic Geometry and Calculus I**

University of Idaho
4 Semester-Hour Credits

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Table of Contents

Welcome!.....	1
Acknowledgment	1
Course Description.....	1
Prerequisites.....	1
Course Materials	1
Course Introduction	2
Lessons.....	2
Exams.....	2
Grading	3
Contacting Your Instructor	4
Disability Support Services.....	4
Assignment Submission Log	5
Lesson 0: Review (<i>Self-Study</i>).....	8
Lesson 1: Functions I.....	10
Lesson 2: Functions II	12
Lesson 3: Limits I	13
Lesson 4: Limits II	18
Lesson 5: Continuity and Rates of Change	20
Lesson 6: The Derivative	22
Lesson 7: Differentiation Formulas.....	23
Exam 1 Information: Covers Lessons 0–7	25
Lesson 8: Trigonometric Differentiation	26
Lesson 9: The Chain Rule	27
Lesson 10: Implicit Differentiation	28
Lesson 11: Related Rates	30
Lesson 12: Differentials	32
Lesson 13: Extrema	33
Lesson 14: The Mean Value Theorem	34
Exam 2 Information: Covers Lessons 8–14	35
Lesson 15: Graphs I	36
Lesson 16: Graphs II	39
Lesson 17: Graphs III	40
Lesson 18: Optimization	41
Lesson 19: Newton’s Method and Antidifferentiation	43
Lesson 20: Areas and Distances	44
Lesson 21: The Definite Integral	45
Exam 3 Information: Covers Lessons 15–21	46

Lesson 22: The Fundamental Theorem of Calculus 47
Lesson 23: Indefinite Integrals 48
Lesson 24: Substitution 49
Lesson 25: Areas 51
Lesson 26: Volumes I 53
Lesson 27: Volumes II 54
Lesson 28: Inverse Functions 55

Exam 4 Information: Covers Lessons 22–28 56

Lesson 29: Exponential Functions 57
Lesson 30: Logarithmic Functions 59

Final Exam Information: Comprehensive 60

Appendix and Forms Table of Contents i

Appendix: Independent Study in Idaho Policies and Procedures iii

See for information on registration, lessons/exams, instructor contact, etc.

Forms for Independent Study in Idaho

Independent Study in Idaho

This course is offered by the University of Idaho.


Analytic Geometry and Calculus I

4 Semester-Hour Credits: UI

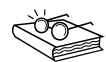
Welcome!

Whether you are a new or returning student, welcome to the Independent Study in Idaho (ISI) program. Before beginning this course, read the information provided below, including course description, prerequisites, required materials, course objectives, and information about lessons, exams, and grading.

Important!

As you read this section, you will see the following icon: 

Use this icon to direct yourself to the **Appendix** in the back of this study guide for essential registration information, Independent Study in Idaho policies and procedures, and forms you will need to successfully complete this course. You are responsible for understanding and following ISI policies and procedures.



Turn to the **Appendix** now. Familiarize yourself with the information in the *Registration* section, student responsibilities in *Academic Integrity*, and the necessary forms. If there is anything you do not understand, please contact the ISI office for clarification before starting your course.

Acknowledgement

The course developer would like to thank a student, Michelle Fickle, for doing the word processing for this course. Without her expertise and attention to detail, this study guide would never have been completed.

Course Description

Functions, limits, continuity, differentiation, integration, applications, differentiation and integration of transcendental functions.

Prerequisites

Two years of high school algebra (or Math 143 or comparable Precalculus course), 1 year plane geometry, ½ year analytic trigonometry, and sufficiently high score on the SAT, ACT, or Math Placement Test.

Course Materials

Required Course Materials

- Stewart, James. *Single Variable Calculus*. Fourth edition. Pacific Grove: Brooks/Cole Publishing Company, 1999. ISBN 0-534-35562-5

Independent Study in Idaho course materials are available for purchase at the University of Idaho Bookstore. Visit the UI Bookstore's Web site, <http://www.uidahobookstore.com>, select *Textbook, Independent Study* for a list of course materials. You may order online, by telephone, (208) 885-7334, or by e-mail to uiboooks@uidaho.edu.

Independent Study in Idaho courses are updated and revised periodically. Ordering course materials from the UI Bookstore at the time of registration allows you to purchase the correct edition(s) of textbooks, study guides, and supplemental materials. If purchasing textbooks from another source, refer to the

ISBN(s) for the textbook(s) listed for this course to ensure that you obtain the correct edition(s). If you have questions regarding the course materials you have ordered and received, contact the UI Bookstore.

Course Introduction

This course is intended to give the student an understanding of the fundamental concepts of calculus. There are two main parts to Calculus I: differentiation and integration. Basically, differentiation extends the notion of slope of a line to slope of a curve and integration extends the notion of areas of polygons to areas of irregular, curved shapes. You are about to greatly expand your perception of mathematics. I hope you find this journey both exciting and rewarding.

Lessons

Overview

Each lesson includes the following components:

- a reading assignment
- an overview
- self-study practice problems
- a graded assignment.

Reading mathematics takes practice, time, and effort. You should spend a lot of time reading the text and lesson overview. Read very slowly, thinking about each sentence. Read with a pencil in hand so you can write in the margins and work through the given examples. You will usually need to write out more steps than are in the text. The author often skips steps in order to keep the number of pages down to a manageable size. If you have any questions on the reading, you can submit them to the office and they will be forwarded to the grader.

The **practice problems** are intended to help develop your understanding of the basic concepts and to increase your competence with the algebraic manipulations needed to solve problems. It is often said that math is not a spectator sport. In order to learn the math, you must **do** the math. The answers to these problems can be found in the back of the textbook. Do not turn in the practice problems unless you think the textbook is in error or if you just can't solve one of these, then send it along with your graded assignment and the grader will send you a response.

Graded assignments need to be done neatly and completely. You are going to be graded on the thoroughness of your work as well as on its accuracy.

Study Hints

- Complete all assigned readings.
- Set a schedule allowing for completion of the course one month prior to your desired deadline. (An *Assignment Submission Log* is provided for this purpose.)



See the **Appendix** at the back of this study guide for essential *ISI policies on submitting lessons to your instructor*. See the letters sent in your registration packet for *your instructor's requirements: how to format and submit lessons; number of lessons you may submit at one time, and lesson guidelines*.

Exams

Overview

- You must wait for grades and comments on lessons prior to taking each subsequent exam.
- For your instructor's exam guidelines, refer to the letters sent in your registration packet and the *Exam Information* sections in this study guide.

For the first four exams you will be allowed 75 minutes. They will cover only the material studied since the previous exam. The exams will be made up of problems similar to the practice problems and graded assignments.

The final exam will be similar to the first four exams except that it will cover the entire course and you will be allowed two hours.

It is advisable to wait until the graded assignments are returned to you before taking the exam over that material. This way you can be sure your procedures are correct. Submit all lessons preceding each exam prior to requesting it.

Calculators

Since hand-held calculators that will perform calculus operations are now available and since exam proctors may be unfamiliar with the different types of calculators, you will not be allowed a calculator on the exams. However, there are lessons where you will need a basic scientific calculator.

See *Grading* for specific information on exams, points, and percentages.

Choosing a Proctor/Scheduling Exams

All exams require a proctor unless an exam is self-administered.



See the **Appendix** for guidelines on *how to choose a proctor and schedule exams*.

Grading

There will be a total of 700 points, as follows:

Assignments (average %)	100 points
Exams (4 @ 100)	400 points
Comprehensive Final	<u>200 points</u>
	700 points

It is a Mathematics Department Policy that no student may pass without taking all exams.

A letter grade is assigned at the end of the course as follows:

A	700 – 630	(90%)
B	629 – 560	(80%)
C	559 – 490	(70%)
D	489 – 420	(60%)
F	419 – 0	

Lessons will be graded on a scale of 0 – 10, at half-point increments (i.e. It's possible to get 8.5, but not possible to get 8.2.) There is an average of 10 problems per lesson, but the type of error made (arithmetic, algebraic, or conceptual) will be considered when assigning a grade. In other words, it's possible to get an A (10, 9.5, or 9) even though you get more than one answer wrong, if you only have minor arithmetic or algebraic errors.

Exams will be graded a little more stringently, but since the total is 100 points, there is more flexibility. You will receive large amounts of partial credit for having the basic Calculus concepts correct, but every arithmetic or algebraic error will be a deduction of at least one point, depending on the complexity of the

error. Also remember, as mentioned on the previous page, the exam problems will be similar to the examples and exercises.

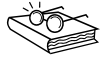
The final course grade is issued after **all** lessons and exams have been graded.



See the **Appendix** for information about *confidentiality of student grades, course completion and time considerations*, and *requesting a transcript*.

Contacting Your Instructor

You will receive *course and instructor contact information* in your registration packet.



See the **Appendix** for detailed information on *contacting your instructor*.

Disability Support Services



See the **Appendix** for *information on Disability Support Services (DSS)*.

Assignment Submission Log

Lesson	Reading	Practice Problems	Graded Assignment
0	pp. A2-A15	A9 #1 – 11 odd, 25, 27, 35 A15 #21 – 35 odd, #27	None
1	Preview & pp. 2-21	pp. 22 – 24 #1, 5, 7, 11, 19, 21, 23, 29, 31, 39	pp. 22-24 #2, 6, 8, 22, 24, 25, 33, 34, 35, 36, 40
2	pp. 24-36	pp. 35-36 #1, 3, 7, 13 pp. 46-48 #1, 3, 5, 9, 13, 19, 21, 35, 39, 41, 45-55 odd	pp. 35-36 #2, 9 pp. 46-48 #8, 14, 24, 42, 52, 54
3	pp. 66-81	pp. 71-72 #1, 3, 5 pp. 81-83 #3, 5, 7, 9, 13	pp. 71-72 #4 pp. 81-83 #1, 2, 4, 6, 8, 14
4	pp. 84-91	pp. 91-93 #1, 11-27 odd, 37, 39, 43, 45	pp. 91-93 #12, 14, 16, 18, 20, 22, 24, 26, 38, 40, 42, 44, 46
5	pp. 104-121	pp. 112-114 #1, 3, 5, 15, 17, 19, 35, 39 pp. 121-123 #1,3, 5a (ii), 5b, 15	pp112-114 #16, 18, 20, 34 pp. 121-123 #2, 6a (ii), 6b, 7, 9, 11
6	pp. 128-144	p.134 #3, 5, 25 pp. 144-145 #1, 3, 5, 7, 9, 19, 23	p. 134 #6, 7 pp. 144-145 #17, 18, 20, 21, 22, 24
7	pp. 147-155	pp. 156-157 #1-25 odd, 31, 33, 35, 39, 51, 55, 57, 63	pp. 156-157 #4, 14, 21, 32, 49, 52, 55, 64, 67
It is time to make arrangements with your proctor to take Exam 1.			
8	pp. 170-175	pp. 175-176 #1-15 odd, 21, 23	pp. 175-176 #2, 4, 6, 10, 12, 22, 35, 36, 39, 40
9	pp. 177-182	p. 183 #7, 9, 11, 15, 23, 25, 27, 29, 31, 43, 45, 51	p. 183 #8, 10, 16, 17, 19, 30, 35, 36, 37, 44
10	pp. 185-196	p. 190 #5, 7, 9, 11, 15, 17, 19 pp. 197-198 #5, 7, 11, 15, 19, 25	p. 190 #10, 13, 18, 20 pp. 197-198 #6, 8, 16, 26, 29, 31, 43, 47
11	pp. 199-203	p. 203 #1, 3	p. 203-205 #5, 7, 9, 11, 13, 15, 21, 29

12	pp. 205-210	pp. 211-212 #27, 29	pp. 203-204 #6, 8, 18 p. 212 #28, 30, 31, 33, 34, 39, 41
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13	pp. 222-229	pp. 230-231 #1, 3, 5, 7, 9, 11, 13, 15, 25, 29, 31	pp. 230-231 #4, 6, 16, 30, 33, 41, 43, 47, 51, 57
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14	pp. 234-238	pp. 238-239 #1, 7, 11, 13	pp. 238-239 #2, 5, 6, 8, 12, 14, 15, 16
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It is time to make arrangements with your proctor to take Exam 2.

15	pp. 240-246	pp. 247-248 #1, 3, 5, 7, 9, 21, 23, 25	pp. 247-248 #2, 6, 8, 22, 26, 27, 29, 31, 33, 35
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16	pp. 249-257	pp. 260-262 #1, 3, 11, 13, 15, 27, 37, 47, 49	pp. 260-262 #4, 12, 14, 38, 39, 41, 45, 48, 50
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17	pp. 263-269	p. 270 #9, 17	p. 270 #3, 5, 10, 15, 22, 30, 35, 43
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18	pp. 277-282	pp. 282-283 #1, 3, 5, 7, 9, 11, 17	pp. 282-283 #6, 8, 18, 28, 29, 30, 31, 38, 39 Extra Credit : #34, 48
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19	pp. 293-304	p. 297 #1 pp. 304-305 #3-29 odd, 33, 35, 39, 53, 55	p. 297 #2, 5, 7, 9, 13 pp. 304-305 #6, 14, 34, 40, 57
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20	pp. 3 & 312-322	pp. 322-323 #1, 3, 5	pp. 322-323 #2, 4, 11, 12, 13, 14
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21	pp. 324-334	pp. 334-336 #3, 5, 37, 43, 45	pp. 334-336 #29, 30, 31, 32, 33, 34, 35, 36, 38, 44, 46
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It is time to make arrangements with your proctor to take Exam 3.

22	pp. 337-344	pp. 344-345 #5, 7, 9, 17, 19, 21, 23, 25	pp. 344-345 #18, 20, 22, 24, 26, 27, 28, 29, 30, 33
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23	pp. 346-352	pp. 352-354 #5, 7, 17, 19, 21, 31, 35	pp. 352-354 #9, 11, 13, 23, 25, 27, 37, 39, 53, 55
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24	pp. 356-361	pp. 361-362 #1, 3, 5, 7, 9, 17, 19, 21, 23, 25	p. 362 #11, 12, 20, 27, 30, 41, 43, 45, 47, 51
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25	pp. 370-376	pp. 376-377 #1, 3, 5, 7, 9	pp. 376-377 #11, 13, 14, 15, 16, 17, 19, 39, 41
26	pp. 378-386	None	p. 387 #1-7, 9
27	pp. 389-392	None	pp. 392-393 #3, 4, 5, 9 Course Outline p. 49 a, b, c, d
28	pp. 406-414	pp. 414-415 #1, 3, 5, 7, 9, 11, 13, 15, 19 25, 27, 29, 33, 35, 37	pp. 414-415 #2, 22, 26, 28, 36, 39, 40, 43

It is time to make arrangements with your proctor to take Exam 4.

29	pp. 416-425	pp. 425-428 #21, 23, 29, 33, 35, 37, 39, 41, 43, 65, 71, 73, 77	pp. 426-428 #36, 38, 42, 44, 61, 63, 66, 72, 75, 79
30	pp. 428-443	pp. 443-444 #3, 5, 7, 13, 17, 19, 23, 39, 67, 71, 73, 75	pp. 443-444 #9, 15, 21, 25, 35, 40, 42, 69, 72, 81

It is time to make arrangements with your proctor to take the Final Exam.

Lesson 0

Review (*Self-Study*)

Reading Assignment

Read pages vii, and from the appendix in the back, A2-A15.

Overview

The amount of algebra review needed will have to be your individual decision. Even though you should have studied functions extensively in precalculus, we will devote the first two regular lessons (Chapter 1) to reviewing functions since they are the building blocks of Calculus.

The most important things for you to review in appendixes A & B are:

- (1) interval notation – table 1 on page A4
- (2) quadratic inequalities – examples 3 & 4 on pages A5 & A6
- (3) using the definition of absolute value – example 5 on page A7
- (4) the point-slope form of lines – examples 3 & 4 on page A13
- (5) parallel & perpendicular lines – examples 7 & 8 on pages A14 & A15.

Additional comments & examples (the numbers correspond to the five topics above):

(1) Algebraic Notation	Interval Notation
$-4 < x < 2$	$(-4, 2)$
$-4 \leq x \leq 2$	$[-4, 2]$
$x > 5$	$(5, \infty)$
$x \leq 5$	$(-\infty, 5]$

- (2) Solving quadratic inequalities is going to be useful for finding the domains of some functions. Without a graph, we can use a method called the Critical Numbers Method.

For example, to solve $x^3 - 6x < x^2$,

Step 1: Get zero on one side. $x^3 - x^2 - 6x < 0$

Step 2: Factor completely. $x(x^2 - x - 6) < 0$
 $x(x + 2)(x - 3) < 0$

Step 3: Find the critical numbers: $x(x + 2)(x - 3) = 0$
 $x = 0, x = -2, x = 3$

Step 4: Use test values to find the solution:

The three critical numbers -2 , 0 , and 3 , divide the real # line into four intervals:
 $(-\infty, -2)$, $(-2, 0)$, $(0, 3)$, $(3, \infty)$.

Choose one number in each interval and use it to evaluate $x(x + 2)(x - 3)$.

Interval	$(-\infty, -2)$	$(-2, 0)$	$(0, 3)$	$(3, \infty)$
Test #	-3	-1	1	4
$x(x + 2)(x - 3)$	$(-3)(-3+2)(-3-3)$ (neg)(neg)(neg) negative	$(-1)(-1+2)(-1-3)$ (neg)(pos)(neg) positive	$(1)(1+2)(1-3)$ (pos)(pos)(neg) negative	$(4)(4+2)(4-3)$ (pos)(pos)(pos) positive

Since we are solving $x(x + 2)(x - 3) < 0$ (negative), the solution is: $(-\infty, -2) \cup (0, 3)$.

If we were solving $x(x + 2)(x - 3) \geq 0$ (positive or zero), the solution would be $[-2, 0] \cup [3, \infty)$.

(3) Rewriting absolute value functions into its two components will be necessary for future work. For example:

$$\frac{|x|}{x} = \begin{cases} \frac{x}{x} & \text{if } x \geq 0 \\ \frac{-x}{x} & \text{if } x < 0 \end{cases}$$

$$= \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$$

(4) & (5) The point slope form of a line is the most widely used form whenever you have to find the equation of a line. For example:

- The equation through $(5, 1)$ with slope of -3 is $y - 1 = -3(x - 5)$.
- The equation through $(2, -1)$ parallel to $y = 4x + 5$ is $y + 1 = 4(x - 2)$.
- The equation through $(2, -1)$ perpendicular to $y = 4x + 5$ is $y + 1 = -\frac{1}{4}(x - 2)$.

Unless told otherwise, you may leave your equations in this form. However, in order to check answers in the back of the text, you will have to rewrite them in whatever form the book uses.

Practice Problems

A9 #1 – 11 odd, 25, 27, 35

A15 #21 – 35 odd, #27 (hint: y-intercept -2 is the point $(0, -2)$)

Do not submit this lesson for grading.