Department of Mathematics & Statistics
Concordia University

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MATH 203
Differential & Integral Calculus I
Summer 2019

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Instructor*: _____

Office/Tel No.: _____

Office Hours: _____

*Students should get the above information from their instructor during class time. The instructor is the person to contact should there be any questions about the course.

Text: *Thomas' Calculus: Early Transcendentals, Single Variable, (ed. 14)* Books a la Carte edition plus MyLab Math, (Pearson).

Prerequisite: Math 201 or an equivalent Functions course.

Pre-test: A pre-test is posted on the Meta Moodle site of this course to help students determine if their prerequisite mathematical background is strong enough to take this course. Students are encouraged to go to the Meta site, click on README: About the Pre-test and then take the test itself to see where they stand. The results of the test may be used by the course coordinators to advise students on what remedial actions they can take if they perform poorly on this pre-test.

Office Hours: Your professor will announce her/his office hours during which she/he will be also available to give a reasonable amount of help. Note, however, that if you missed a class you should not expect your professor to cover the missed material for you.

Tutorials: The material in this course requires a lot of practice. There is not enough class time to do all the examples and problems needed to learn the material thoroughly. The Department has therefore organized special tutorial sessions conducted every week to provide additional support to students outside the lecture room environment. These sessions are conducted by tutors who will help with solving problems on the topics learned in class that week, with particular emphasis on the material that students may have difficulties with in this course. Students may attend any of the scheduled tutorials, not necessarily the one for which they are registered, and are strongly encouraged to participate and be active at these problem-solving sessions. Tutorials are an important resource to help students succeed in this course.

Math Help Centre: In addition to Tutorials, a Math Help Centre staffed by graduate students is available. The schedule of its operation and its location will be posted in the Department and on the Department webpage (https://www.concordia.ca/artsci/math-stats/services/math-help-centre.html).

WeBWorK: Every student will be given access to an online system called **WeBWorK**. The system provides you with many exercises. Students will use this system to do online assignments (see **Assignments** below). In addition, before the midterm test and before the final exam, a number of practice problems will be posted in WeBWorK to help you review the material of the course.

MyLab Math: Every student who purchases the loose-leaf version of the textbook will be given access to one more online system called **MyLab Math**. This system contains an E-version of the textbook, as well as a large number of various resources, like practice exercises, typical examples on different topics, often with solutions, video materials, etc., that help you master the course material.

Assignments: Students are expected to submit assignments online using **WeBWorK**. Late assignments **will not** be accepted. Assignments contribute 10% to the final grade. Working regularly on the assignments is essential for success in this course. Students are also strongly advised to do as many problems as their time permits from the list of recommended problems included in this outline, as well as work on the practice exercises opened in WeBWorK and in MyLab.

Calculators: Only calculators approved by the Department (with a sticker attached as a proof of approval), such as **Sharp EL 531** or the **Casio FX 300MS**, available at the Concordia Bookstore, are permitted for the class test and final examination. See www.concordia.ca/artsci/math-stats/services.html

Midterm Test: There will be one **midterm test** in Week 4 (based on the material of weeks 1-3) which will contribute up to 25% to your final grade (see the Grading Scheme below).
NOTE: It is the Department's policy that tests missed for any reason, **including illness,** cannot be made up. If you miss the midterm test **because of illness** *(medical note required)* the final exam will count for 90% of your final grade, and the Assignments will count for the remaining 10%.

Final Exam: The final examination will be three hours long and will cover all the course material.

NOTE: Students are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts with the final exam schedule must be reported directly to **the Examinations Office, not to your instructor**. It is the Department's and the Examinations Office's policy that **students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

Grading Scheme: The final grade will be based on the higher of (a) or (b) below:
a) 10% for the assignments, 25% for the midterm test, 65% for the final exam.
b) 10% for the assignments, 10% for the midterm test, 80% for the final exam.

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity."
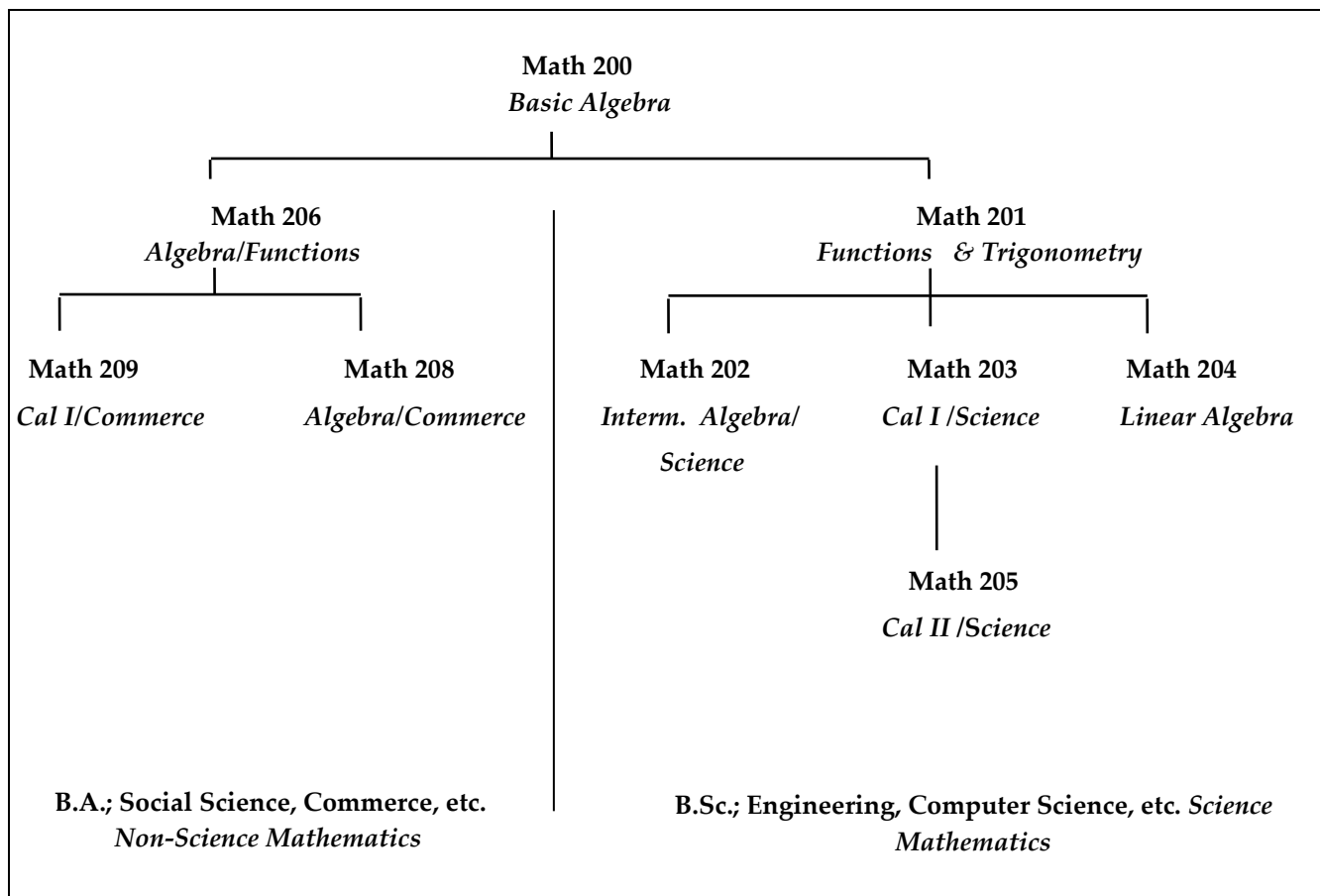*[Undergraduate Calendar, Sec 17.10.2]*

CONTENTS

Note: All of Chapter 1 is a review of material that is covered in prerequisite courses, and is important for this course. The material that is skipped in this review will be introduced briefly later in the course when needed. <u>If you don't know this preliminary material thoroughly, or</u> if you feel you don't know it well enough after the first class or so you may want to consider dropping the course and taking MATH 201 instead.

Weeks/Lectures		Topics		Recommended Problems
1/1	1.1	Representations of Functions	p.11:	3, 5, 7, 9, 13, 21, 23, 27, 49, 51
	1.2	Combining Functions; Shifting & Scaling Graphs	p.18:	1, 3, 5, 7, 9, 15, 17, 19, 21, 23, 25
	1.3	Trigonometric Functions	p.27:	7, 9, 11, 15, 19, 25, 29, 37, 47, 49
1/2	1.5	Exponential Functions	p.37:	3, 7, 9, 11, 13, 15, 21, 25, 27, 33
	1.6	Inverse Functions and Logarithms	p.49:	9, 17, 21, 29, 31, 41, 47, 53, 63, 71
2/3	2.1	Rates of change and Tangent Lines	p.61:	1, 3, 5, 23, 25
	2.2	Limit of a Function and Limit Laws	p.71:	3, 5, 13, 15, 19, 25, 27, 37, 55, 65
	2.4	One-Sided Limits	p.88:	3, 7, 9, 15, 17, 19, 33, 37
	2.6	Limits Involving Infinity; Asymptotes	p.112:	1, 9, 11, 21, 27, 35, 41, 71, 87, 89
2/4	2.5	Continuity	p.100:	5, 13, 19, 29, 31, 41, 45, 49, 61
	3.1	Tangent Lines and the Derivatives	p.123:	5, 11, 17, 21, 25, 31, 33
	3.2	The Derivative as a Function	p.130:	3, 9, 11, 17, 23, 25, 55, 59
3/5	3.3	Differentiation rules	p.142:	5, 7, 11, 15, 21, 23, 29, 43, 47, 61
	3.4	The Derivative as a Rate of Change	p.150:	5, 7, 9, 13, 15, 19, 23
3/6	3.5	Derivatives of Trigonometric Functions	p.158:	3, 7, 11, 13, 19, 23, 31, 37
	3.6	The Chain Rule	p.166:	5, 7, 13, 21, 23, 31, 35, 37,45, 63, 77
4		**MIDTERM TEST** (based on the material of weeks 1-3, Lectures 1-6)		
4/7	3.7	Implicit differentiation	p.172:	1, 5, 11, 15, 25, 27, 37, 39, 41
	3.8	Derivatives of Inverse Functions, Logs	p.183:	7, 11, 27, 31, 33, 37, 39, 53, 89, 95
5/8	3.9	Inverse Trigonometric Functions (start with the review of inverses in § 1.6)	p.189:	5, 9, 11, 17, 25, 29, 39, 43, 45
	3.10	Related rates	p.196:	7, 11, 13, 15, 17, 21, 23, 27, 33, 39
5/9	3.11	Linearization and Differentials	p.209:	5, 11, 17, 19, 23, 33, 39, 45, 49, 59
	4.1	Extreme Values of Functions	p.227:	5, 17, 23, 31, 37, 39, 53, 63, 69, 89
6/10	4.2	Mean Value Theorem	p.235:	5, 11, 13, 21, 25, 27, 29, 61, 63, 65
	4.5	Indeterminate forms, L'Hôpital's Rule	p.262:	9, 11, 15, 17, 21, 43, 47, 53, 61, 63
6/11	4.3	Monotonic Functions	p.241:	5, 7, 19, 27, 29, 54, 57, 61
	4.4	Concavity and Curve Sketching	p.251:	5, 9, 13, 17, 31, 37, 43, 81, 85, 99
7/12	4.6	Applied Optimization	p.269:	3, 5, 7, 9, 11, 13, 15, 19, 29, 37, 41
7		**REVIEW CLASS** (*time permitting*)		

Choosing Between Math 201 and Math 203

If the last math course you took was at the high school level (Quebec), and more than five years have passed since, you should probably register for Math 200. If you are still unsure of your level, read on.

Math Courses at Concordia

Math 200
Basic Algebra

Math 206
Algebra/Functions

Math 201
Functions & Trigonometry

Math 209
Cal I/Commerce

Math 208
Algebra/Commerce

Math 202
Interm. Algebra/ Science

Math 203
Cal I /Science

Math 204
Linear Algebra

Math 205
Cal II /Science

B.A.; Social Science, Commerce, etc. *Non-Science Mathematics*

B.Sc.; Engineering, Computer Science, etc. *Science Mathematics*

A self-administered test to help you decide between Math 201 and Math 203 follows. Give yourself about 30 minutes to complete the test. Be honest with yourself, since registering in the wrong course may cost you money and result in a poor grade. Remember that all university-level courses usually demand quite a bit of your time. Students in Math 203 will find they will not have time once the course begins to review material that they are expected to know before they enter the course.

Scoring: 10 or less = Math 201; 11-14 = see an advisor; 15 or better = Math 203. Answers are on the last page.

MATH 203
Qualifying Test

1) What is the equation, in *slope–intercept* form, of the line whose slope is 7 and whose *y–intercept* is –3?

   a) $y = -3x + 7$ b) $y = 7x - 3$
   c) $y = 7x + 21$ d) $y = 7x - 21$
   e) $y = -7x + 3$

2) What is the slope of any line *parallel* to the line $5x + 6y = 30$?

   a) $-\dfrac{6}{5}$ b) $-\dfrac{5}{6}$ c) 0 d) $\dfrac{5}{6}$ e) $\dfrac{6}{5}$

3) The lines $-4x + 5y = -10$ and $5x + ky = 12$ are perpendicular. What is the value of k?

   a) –5   b) –4   c) 4   d) 5   e) 10

4) Find the coordinates of the *midpoint M*, and the *length L* of the line segment joining the points $(3, -2)$ and $(4, -1)$. Answer in simple radical form.

   a) $M\left(\dfrac{7}{2}, -\dfrac{3}{2}\right),\ L = \sqrt{2}$ b) $M\left(\dfrac{7}{2}, \dfrac{3}{2}\right),\ L = \sqrt{3}$ c) $M\left(\dfrac{1}{2}, -\dfrac{1}{2}\right),\ L = \sqrt{2}$

   d) $M\left(-\dfrac{1}{2}, \dfrac{1}{2}\right),\ L = \sqrt{2}$ e) $M\left(\dfrac{1}{2}, -\dfrac{1}{2}\right),\ L = \sqrt{3}$

5) What is the equation of the line having a slope of 0 and passing through the point $(-6, -1)$?

   a) $x = -6$ b) $x = -1$ c) $y = -6$
   d) $y = -1$ e) $y = \dfrac{1}{6}$

6) Factor: $2x^2 + 11x + 15$

   a) $(2x+3)(x+5)$ b) $(x+3)(x+5)$ c) $(2x+15)(x+1)$
   d) $(2x+5)(x+3)$ e) $(2x+1)(x+15)$

7) The expression $x^2 - 10kx + R$ is a perfect square. Find the value of R.

   a) 25   b) $5k^2$ c) $25k^2$
   d) $100k^2$ e) $25k^2x^2$

8) Consider solving $x^2 + 12x + 5 = 0$ by completing the square: $x^2 + 12x +$ ____ $= -5 +$ ____
What is the number that goes in the blanks?

   a) 144   b) 36   c) 16   d) –16   e) –36

9) Solve $3x^2 - 5x - 1 = 0$ using the Quadratic Formula.

a) $\dfrac{-10 \pm \sqrt{101}}{3}$ b) $\dfrac{-5 \pm \sqrt{37}}{6}$ c) $\dfrac{5 \pm \sqrt{37}}{6}$

d) $\dfrac{10 \pm \sqrt{101}}{9}$ e) $\dfrac{10 \pm \sqrt{101}}{3}$

10) The graph of the parabola $y = x^2 + 6x + 13$ is symmetric about a line. What is the equation of that line?

a) $x = -3$ b) $x = 0$ c) $x = 3$
d) $y = 0$ e) $y = 3$

11) What is the equation of the circle centered at $(4, -5)$ with a radius of 16?

a) $(x + 4)^2 + (y - 5)^2 = 16$ b) $(x - 4)^2 + (y + 5)^2 = 4$
c) $(x + 4)^2 + (y - 5)^2 = 256$ d) $(x - 4)^2 + (y + 5)^2 = 256$
e) $(x + 4)^2 + (y - 5)^2 = 4$

12) Determine which of the following triangles are right triangles if the sides' lengths are:
I) 8, 15, 17   II) 4, 5, 6   III) 2, 2, 3   IV) 9, 12, 15

a) I only   b) II only   c) III only   d) I and IV only   e) I, II and IV

13) A triangle ABC has right angle B. Sides AB and BC have the lengths 3 and 4 respectively. Determine the cosine of angle A ($\cos A$).

a) $\dfrac{3}{5}$ b) $\dfrac{3}{4}$ c) $\dfrac{4}{5}$ d) $\dfrac{4}{3}$ e) $\dfrac{5}{3}$

14) Which of the following ratios is the tangent of an angle?

a) $\dfrac{opposite}{hypotenuse}$ b) $\dfrac{hypotenuse}{adjacent}$ c) $\dfrac{adjacent}{hypotenuse}$

d) $\dfrac{hypotenuse}{opposite}$ e) $\dfrac{opposite}{adjacent}$

15) What is the value of $\sin \dfrac{2\pi}{3}$?

a) $\dfrac{1}{2}$ b) $-\dfrac{1}{2}$ c) $\dfrac{\sqrt{3}}{2}$ d) $\dfrac{-\sqrt{3}}{2}$ e) $\dfrac{\sqrt{2}}{2}$

16) What is the value of $\cot \dfrac{3\pi}{2}$?

a) 0   b) 1   c) -1   d) $\dfrac{\sqrt{2}}{2}$ e) does not exist

17) What is the value of $\log_2 64$?

 a) 6 b) 8 c) 16 d) 128 e) 4096

18) Which of the following is equal to $\log_k A = \dfrac{3}{2}$?

 a) $k = \sqrt[3]{A}$ b) $k = \left(\dfrac{3}{2}\right)^A$ c) $\dfrac{3}{2} = \sqrt[k]{A}$ d) $A = k\sqrt{\dfrac{3}{2}}$ e) $A = \sqrt{k^3}$

19) Write as a single logarithm: $\log_8 5 - 2\log_8 6$

 a) $\log_8 \dfrac{5}{36}$ b) $\log_8 \dfrac{5}{12}$ c) $\log_8 11$ d) $\log_8 41$ e) $\log_8 180$

20) What is the result when $\log \dfrac{AB}{\sqrt{C}}$ is expanded?

 a) $\log A + \dfrac{1}{2}\,(\log B - \log C)$ b) $\dfrac{1}{2}\,(\log A + \log B - \log C)$

 c) $\log A + \log B - 2\log C$ d) $\dfrac{1}{2}\,(\log A \log B - \log C)$

 e) $\log A + \log B - \dfrac{1}{2}\log C$

ANSWERS: 1. b); 2. b); 3. c); 4. a); 5. d); 6. d); 7. c); 8. b); 9. c); 10. a); 11. d); 12. d); 13. a); 14. e); 15. c); 16. a); 17. a); 18. e); 19. a); 20. e)