



Department of Mathematics & Statistics

**MATH 314**

# **Calculus and Linear Algebra with Business Applications**

**FALL 2021**

## ***Professor Information***

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Professor: Stephen Brown  
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Office Hours: See Moodle for various in-person and online options.

## ***Section Information***

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Section: 001  
Class Times: Tue 11:00 - 12:20 Online  
Thu 11:00 - 12:20 Online  
Fri 13:00 - 13:50 Online

## ***Calendar Description***

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### **Math 314-3-3**

#### **Calculus and Linear Algebra with Business Applications**

This calculus and linear algebra course covers business applications. Topics include, but are not limited to, functions and linear equations, systems of equations, matrix algebra, including matrix multiplication, matrix inversion and solving matrix equations, linear programming, differentiation and integration. Applications to cost, revenue and profit functions, break-even models, the production mix problem, the portfolio problem, profit maximization and optimization in several variables and a calculus-based approach to the mathematics of finance will be discussed. (4,0,0)

Prerequisites:

- MATH 114
- third-year standing or admission to any Post-Baccalaureate Diploma program.

## ***Transfer Information***

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Please refer to the transfer guide, available online at <http://www.bctransferguide.ca>. Students are encouraged to save a copy of current transfer information for their own records.

## ***Course Materials***

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There is no required text for this course. However, the following textbook is suggested for many additional practice exercises and examples.

Waner, Stefan & Costenoble, Steven R., **Finite Mathematics and Applied Calculus, 7<sup>th</sup> Edition with WebAssign Access**  
Cengage Learning, 2018, ISBN: 978-1-337-87975-0

# Course Content

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Unit 1: Functions	Textbook Sections
1.1 Functions Notation and Graphs	1.1
1.2 Combining Functions	1.2
1.3 Linear Functions	1.3
1.4 Quadratic Functions	2.1
1.5 Exponential Functions	2.2
1.6 Logarithmic Functions	2.3
1.7 Mathematical Models	2.2, 2.3, 2.4
Unit 2: Linear Algebra	Textbook Sections
2.1 Systems of Linear Equations	4.1
2.2 Solving Systems of Linear Equations	4.2
2.3 Underdetermined and Overdetermined Systems	4.2, 4.3
2.4 Matrices	5.1
2.5 Matrix Multiplication	5.2
2.6 The Inverse of a Matrix	5.3
2.7 Applications of Matrices	5.4, 5.5
Unit 3: Linear Programming	Textbook Sections
3.1 Linear Inequalities	6.1
3.2 Linear Programming Problems	6.2
3.3 Graphical Solutions to Linear Programming Problems	6.2
3.4 The Simplex Method for Standard Maximization Problems	6.3, 6.4
3.5 The Simplex Method and Duality	6.5
Unit 4: Differential Calculus	Textbook Sections
4.1 Limits	10.1
4.2 The Derivative	10.4, 10.5, 10.6
4.3 Basic Rules of Differentiation	11.1, 11.2, 11.5
4.4 The Product Rule	11.3
4.5 The Quotient Rule	11.3
4.6 The Chain Rule	11.4, 11.5
4.7 Optimization: The Closed Interval Method	12.1, 12.2
4.8 Optimization: The First and Second Derivative Tests	12.3, 12.4, 12.6
Unit 5: Integral Calculus	Textbook Sections
5.1 Antiderivatives	13.1
5.2 Integration by Substitution	13.2
5.3 Area and the Definite Integral	13.3
5.4 The Fundamental Theorem of Calculus	13.4
5.5 Evaluating Definite Integrals	13.4, 14.3
5.6 Area Between Curves	14.2
5.7 Application: Consumers' and Producers' Surplus	14.4
5.8 Application: Lorenz Curves and the Gini Index	

## ***Learning Outcomes***

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The following are the anticipated learning outcomes of the course.

1. Convert a system of linear equations to a matrix representation and vice-versa.
2. Find solution sets of systems of linear equations using Gauss-Jordan elimination.
3. Determine if a system of linear equations has a unique solution or is under/overdetermined.
4. Perform calculations using the algebraic properties of matrices and vectors.
5. Calculate the inverse of a matrix using Gaussian elimination.
6. Find an optional solution to a linear programming problem using the simplex method.
7. Calculate the derivative of a function using the limit definition of a derivative.
8. Calculate derivatives using rules for polynomial, exponential, and logarithmic functions.
9. Calculate derivatives using the following techniques: product rule, quotient rule, chain rule.
10. Calculate and interpret marginal functions in economics.
11. Find the maximum and minimum values of a specified function.
12. Use differentiation to solve problems in applied business topics.
13. Evaluate antiderivatives for polynomial, exponential, and logarithmic functions.
14. Evaluate integrals using the substitution rule.
15. Apply integration to problems involving area, net change and average value.
16. Use integration to solve problems in applied business topics.

## ***Course Evaluation***

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Your grade in this course will be broken down as follows:

<b>20%</b>	<b>Assignments</b> Assignments will be given on a weekly basis. Assignment questions are assigned and graded electronically. Supporting written work will be submitted separately through Gradescope.
<b>40%</b>	<b>Quizzes</b> Quizzes will be given approximately every two weeks. Test questions are assigned electronically and supporting written work will be submitted separately through Gradescope. Tests will be marked manually using a combination of electronic answers and supporting written work. Test dates will be announced in class and posted on Moodle.
<b>40%</b>	<b>Final Exam</b> The final exam will be cumulative and held at a time set by the college. The final exam schedule is generally made available approximately half way through the semester.
<b>100%</b>	<b>Total</b>

## ***Online Examination Policy***

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Some students may be selected for individual follow-up interviews after examination. Such students will be contacted via email after the examination and will be requested to participate in a short interview about their conduct during the examination and how they arrived at specific answers they submitted. Any student whose activities during the exam attracted particular attention or suspicion from their invigilator will be more likely to be requested to participate in a post-exam interview.

## ***Department Policies***

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- All written assignments are due at the start of class. All assignments not handed in within the first five minutes of class will be assigned a grade of zero.
- The math department does not give make-up exams nor does the department allow students to write exams out of time without a valid medical or compassionate reason.
- It is expected the student attends all classes. If a student misses a class, it is the student's responsibility to get the material covered in class from their peers.
- No students may change sections of a course after the final add/drop date. If students wish to switch sections after the first day of class but before the final add/drop date, they should consult the chair of the Math department in order to not lose grade progress.
- Failure to achieve a grade of at least 45% on the final exam of a course will result in a failing grade for the course.
- When a student fails a course as a result of failing to achieve a final exam grade of 45%, the maximum grade that will be awarded is 49%.
- Calculators used for exams will satisfy the department's calculator policy. For Math 314, students are allowed a Texas Instruments BA II financial calculator or non-programmable, non-graphing scientific calculator.
- A formula sheet will be provided for this course.
- The final exam for this course shall be cumulative.

## ***Important Dates***

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Labour Day (no classes):	Monday, Sep. 6
Orientation Day (no classes):	Tuesday, Sep. 7
Classes begin:	Wednesday, Sep. 8
Last day to register:	Friday, Sep. 17
Last day to receive refund:	Friday, Sep. 17
Last day to withdraw from course (with no record of enrollment on transcript):	Friday, Sep. 17
Thanksgiving Day (no classes):	Monday, Oct. 11
Last day to withdraw from course (W on transcript)	Friday, Oct. 29
Statutory Holiday (no classes):	Thursday, Nov. 11
No classes	Friday, Nov. 12
Last day of regularly scheduled classes:	Monday, Dec. 6
Final exam period:	Wednesday, Dec. 8 to Saturday, Dec. 18

## ***Okanagan College Policies***

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**Final Exam Policy:** The procedures relating to final exams are significantly different than those that involve midterms. Final exam policy is determined by the college and a much more formal process is invoked should a student be unable to write the final exam. It is stated in the final exam policy that student travel plans are not a

valid reason for writing an out-of-time final exam. As such, it is essential that you do not make travel plans prior to the final exam schedule being posted. The full final exam policy can be found at the following link.

<http://webapps-5.okanagan.bc.ca/ok/Calendar/Examinations>

The final exam schedule is determined by the Office of the Registrar and posted at the following link sometime around the middle of the semester.

<https://www.okanagan.bc.ca/office-of-the-registrar/scheduling-office/scheduling-office#finalexam>

**Academic Integrity Policy:** Okanagan College requires that all students are informed of the Academic Integrity Policy included in the College Calendar which can be found at the following link:

<http://webapps-5.okanagan.bc.ca/ok/Calendar/AcademicIntegrity>

**College Student Conduct Policies:** Okanagan College requires that students are informed of acceptable Student Conduct Policies included in the College Calendar which can be found at the following link:

<http://webapps-5.okanagan.bc.ca/ok/Calendar/StudentConduct>

## ***Student Advising & Counselling***

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**Accessibility Services** collaborates with the academic departments of the college to arrange appropriate accommodation for students with a disability. If you require academic accommodation, please contact disability services. Contact, and other relevant information, can be found at:

<https://www.okanagan.bc.ca/accessibility-services>

**Counselling Services** has professionally trained staff that are available to assist students in coping with problem areas in their life (including: personal & career counselling, study skills) that interfere with maximizing their academic and social potential. For more information visit:

<http://www.okanagan.bc.ca/counselling-services>