ALBERTA DISTANCE LEARNING CENTRE
Mathematics 31 Online
MAT3211
Unit 5 Assignment

Student's Questions and Comments

FOR STUDENT USE ONLY

(if label is missing or incorrect)
File Number: _____

Please use the pre-printed label for this course and Assignment

Name
Address
City/Town **Province** **Postal Code**

Apply Assignment Label Here

FOR ADLC USE ONLY

Assigned to _____

Marked by _____

Date received _____

Summary

	Marks Earned	Total Marks	Percent
Unit 5 Assignment		**76**	

Teacher's Comments:

_____
Teacher's Signature

NEW September 2017

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Mathematics 31 Online
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Unit 5 Assignment

4601 - 63 Avenue
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http://www.adlc.ca

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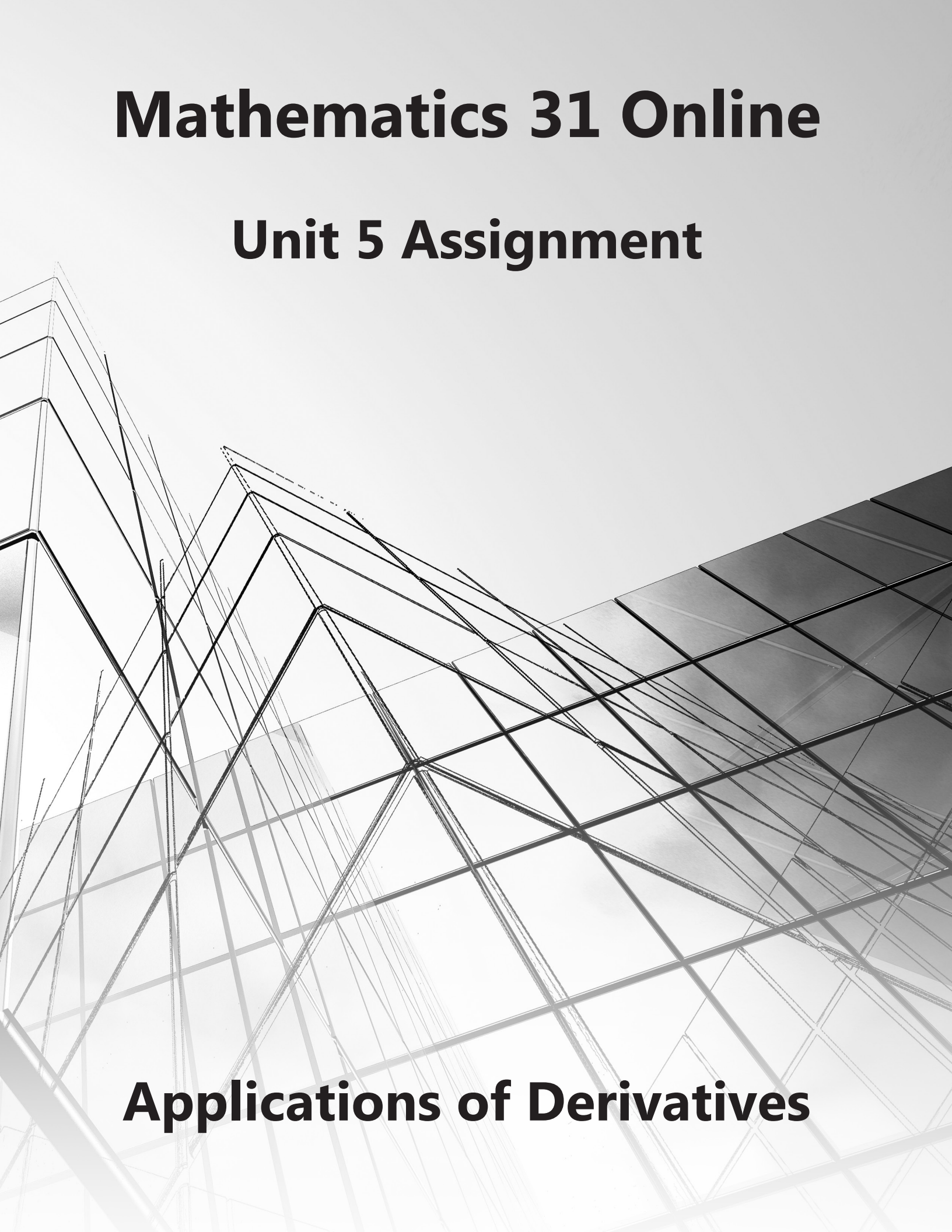
Mathematics 31 Online

Unit 5 Assignment



Applications of Derivatives

Instructions for Submitting Assignments

1. Submit Assignments **regularly** for assessment.

2. Submit only **one Assignment at a time.** This allows your teacher to provide feedback that you can apply to subsequent course work and exams.

3. Check that your **Assignment is complete.** Your Assignment will be returned as **incomplete** if a reasonable attempt with relevant work has not been made. Therefore, **do not leave any questions blank.** Contact your teacher for help **prior** to submitting this Assignment.

4. Attach the correct address label or complete the Assignment coversheet.

5. Submission Methods:

Postal Mail – Mail the completed Assignment to an Alberta Distance Learning Centre office. Ensure that you attach sufficient postage by having the envelope weighed at the post office.

Electronically – Scan the completed Assignment. Save the file to your computer as **Math 31 Assignment# FirstInitial LastName.** Then, upload the file into your marker's dropbox.

In Person – Drop the completed Assignment at an Alberta Distance Learning Centre campus.

Fax – Fax the completed Assignment to an Alberta Distance Learning Centre campus.

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Our Pledge to You:

Enrolling in this course is another step toward an Alberta High School Diploma. Everyone at Alberta Distance Learning Centre is committed to helping students achieve their educational goals. We welcome your contact in person or by phone, fax, e-mail, voice mail, or postal mail.

Advice:

Your achievement in this course is determined by your success in the assessments of each unit. Your responses to assignments indicate your understanding of outcomes established by Alberta Education.

- Before responding to the assigned questions, read all relevant directions for the Assignment and instruction in the course materials, including the appropriate Guide for Learning and any other resources provided.

- When you encounter difficulties, re-read the directions for the Assignment and review the relevant instruction in the Guide for Learning.

- If you require further clarification, contact your Alberta Distance Learning Centre teacher for assistance.

Notice:

You have one opportunity to submit each Assignment.

- Only under exceptional circumstances will your ADLC teacher re-assess your work. Therefore, apply significant effort to each Assignment.

- If your final exam mark is vastly different from your Quiz marks, your teacher may apply discretion in determining your course mark.

Format

You are encouraged to **handwrite** your written work.

If you type your work, be sure to follow these guidelines:

- Include your full name and student file number as a document header.
- Double-space your final copy.
- Staple your printed work to this Assignment.

ADLC Plagiarism Policy (ADLC Administrative Policy 60–1)

Plagiarism is the practice of representing someone else's work or ideas as one's own. It is an academically dishonest practice and is detrimental to a student's knowledge and skill development. ADLC takes a progressive approach to plagiarism to educate and correct the behaviour.

All incidents will be documented and are subject to the consequences outlined below:

First Incident	Second Incident	Third Incident
The student is given zero scores on any work suspected of being plagiarized and given the opportunity to resubmit original work.	The student is given zero scores on any work suspected of being plagiarized and is not given the opportunity to resubmit original work. A letter is sent by the principal to parents and school facilitators outlining this administrative practice and the consequences.	The student is removed from the course in which plagiarized work is suspected and notifications are put into the ADLC Student Information System, barring future registration to the course in question. A withdrawal letter is sent by the principal to parents and school facilitators.

Important

While removal from a course is limited to the course in which the third incident has occurred, the preceding steps can occur across different courses. A student who has been found plagiarizing in Course A and held to the First Incident consequences who then plagiarizes in Course B will move to the Second Incident consequences.

Any further occurrences after the Third Incident in any other courses will result in immediate removal from that course. Ongoing occurrences may result in removal from all courses and barring of registration with ADLC.

Sharing of ADLC Work (ADLC Administrative Policy 60–4)

Plagiarism is the practice of representing someone else's work or ideas as one's own. It is a dishonest practice and is damaging to a student's knowledge & skill development. Plagiarism is addressed in ADLC Administrative Policy 60-01.

The sharing of school work, especially after having been marked by ADLC, to students for the purposes of submitting plagiarized work (either paraphrasing or directly copying student work) is dishonest, and this sharing goes against the Alberta School Act's expectation of students to respect school rules and co-operate with how schools offer education to their students.

ADLC prefers to take a progressive approach to the sharing of work with other students, in order to educate and correct the behaviour.

If a student is currently enrolled in any ADLC course and found to be sharing school work, whether from their current course or another, to others, the following will happen:

First Incidence	Second Incidence
The student is informed that their work has been submitted as plagiarized work by another student; a warning is provided that further submissions of such work, from any course, will be grounds for removal from the current course(s).	The student is removed from all active ADLC courses.

If the student is not currently enrolled in any ADLC course and found to be sharing school work with others, they are informed that their work has been submitted as plagiarized work by another student and, as such, further registrations in any ADLC course will not be permitted. The incident will be recorded on the student's file.

Such actions do not limit ADLC to pursue other remedies (actions), either criminal or civil, for the distribution of its copyrighted materials.

Unit 5 Assignment

Work slowly and carefully. If you are having difficulty, go back and review the appropriate *Lesson*.

As your final exam does not allow a calculator, it is best to attempt all questions in this *Assignment* without a calculator.

Be sure to proofread your assignment carefully.

For full marks, show all calculations, steps, and/or explain your answers.

Total: 76 marks.

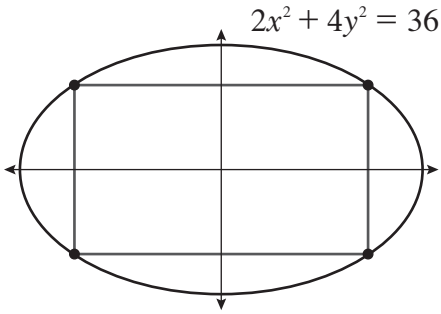
(5) 1. The sum of a number and the square of another number is 27. Find the numbers so that their product is a maximum.

(6) 2. A rectangular box with an open top has a square base. The volume of the box is $108\ \text{cm}^3$. If the box is made of the least amount of material, what must be its dimensions?

(6) 3. A farmer wants to build two adjacent and identical rectangular cattle pens on $60\ 000\ \text{m}^2$ of land. What is the least amount of fencing material required?

(5) 4. A children's picture book is being designed so that each page contains $320\ \text{cm}^2$ of print and pictures, surrounded completely by a white border. The border must be $2\ \text{cm}$ wide at the bottom and on each side and $3\ \text{cm}$ wide at the top. Calculate the dimensions of the page of smallest possible area.
Note: Verification that the dimensions yield a minimum is not needed for this question.

(6) 5. What is the area of the largest rectangle that can be inscribed in the ellipse $2x^2 + 4y^2 = 36$?
Note: Verification that the area is a maximum is not needed for this question.



(7) 6. Find the dimension of a right-circular cylinder of maximum volume that can be inscribed in a sphere of radius $30\ \text{cm}$.

(6) 7. At one end of a $4\ \text{km}$ long, straight beach, there is a boat anchored at point A, $3\ \text{km}$ offshore. At the other end of the beach, there is another boat anchored at point B, $5\ \text{km}$ offshore. A sailor from the first boat must bring a passenger to the beach, and then proceed to the second boat to pick up another passenger. At what point, C, along the beach should the first passenger be dropped in order to minimize the distance travelled by the sailor?
Note: Verification that the distance is a minimum is not needed for this question.

(3) 8. Sarah is in a kayak $250\ \text{m}$ offshore from point A on a straight beach. A storm is brewing and Sarah wishes to go to a shelter located $900\ \text{m}$ down the beach from point A. If Sarah can paddle her kayak at $2\ \text{km/h}$ and walk at $3\ \text{km/h}$, how far down the shore should she beach her kayak to reach the shelter in the shortest amount of time?
Note: Verification that the time is a minimum is not needed for this question.

(7) 9. A property management company manages an apartment block containing 150 units. All 150 units are rented at a monthly rate of $\$460$ per unit and each unit costs the property management company $\$72.50$/month for utilities and repairs. For every $\$25$ rent increase, four fewer apartments are occupied. What rent should be charged in order to realize the most profit?

10. A spherical balloon is being inflated.

(2) a. Find the rate of change of the volume when the radius is $\frac{1}{2}\ \text{cm}$ and changing at a rate of $2\ \text{cm/min}$.

(3) b. If the volume of the balloon is increasing at a rate of $10\ \text{cm}^3/\text{min}$, how fast is the diameter increasing when the radius is $3\ \text{cm}$?

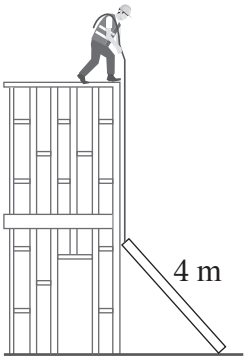
(3) 11. A block of ice has a square top and bottom and rectangular sides. At a certain point in time, the square top and bottom each have a length of $30\ \text{cm}$, which are decreasing at a rate of $2\ \text{cm/h}$. At the same time, the height of the ice block is $20\ \text{cm}$ and decreasing at $3\ \text{cm/h}$. How fast is the ice melting?

(3) 12. The angle of elevation of the sun is decreasing at $\frac{1}{3}$ rad/h. How fast is the shadow cast by a tree 10 m tall lengthening when the angle of elevation of the sun is $\frac{\pi}{6}$ rad?

(5) 13. Two sides of a triangle measure $12\ \text{cm}$ and $15\ \text{cm}$ in length, and the angle between them is increasing at a rate of $2\ \text{rad/min}$. Determine the rate at which the third side is increasing when the angle between the sides of fixed length is $\frac{\pi}{3}$.

(3) 14. A student leaves school on his skateboard heading east. He travels at a rate of $20\ \text{km/h}$. At the same time, another student leaves the school heading directly south at a rate of $22\ \text{km/h}$. At what rate is the distance between the two students increasing when the skateboarder is $5\ \text{km}$ from the school and the biker is $12\ \text{km}$ from the school?

(3) 15. A construction worker pulls a 4 m plank up the side of a building by means of a rope tied to the end of the plank. The opposite end of the plank is being dragged along the ground. If the worker is pulling at a rate of 20 cm/s, how fast is the end of the plank sliding along the ground when it is 2 m from the wall of the building? Express the solution as an exact value.



(3) 16. A water tank is built in the shape of a circular cone with a height of $5\ \text{m}$ and a diameter of $6\ \text{m}$ at the top. Water is pumped into the tank at a rate of $\frac{8}{5}\ \text{m}^3/\text{min}$. Find the rate at which the water level is rising when the water is $2\ \text{m}$ deep.

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