

COMMONWEALTH OF AUSTRALIA

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Family Name	
Given Names	
Student Number	
Teaching Period	Semester 2, 2016

FINAL EXAMINATION	DURATION
ECM262 – Teaching the Curriculum: Maths 2	Reading Time: 10 minutes
	Writing Time: 120 minutes

INSTRUCTIONS TO CANDIDATES

There are three sections to this exam. You need to answer all three.

- **Section A** is of 29 marks, this section deals with your basic and senior mathematics content knowledge.
- **Section B** is of 14 Marks, it deals with writing model solutions. You need to answer any two out of the four questions in this section.
- **Section C** is of 28 marks, this section is concerned with your pedagogical content knowledge and assessment of students' work.

Please note that under the authorised materials, Lecture Text books include any Senior Maths Text Book.

EXAM CONDITIONS

This is a RESTRICTED OPEN BOOK examination

Any calculator is permitted

One A4 sheet of handwritten double-sided notes permitted

Any hard copy, unannotated dictionary is permitted

Answer on both exam paper and supplied material/s

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
Lecture Textbook/s (Unannotated)	1 x 8 Page Book
Lecture Notes (Unannotated)	Graph Paper

**THIS EXAMINATION IS PRINTED
DOUBLE-SIDED.**

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Section A
Multiple Choice Questions
(Basic and Senior Mathematics Content Knowledge)

Please ensure that your name and student number have been written on the Answer Booklet.
Almost all the questions in the paper should be answered on the question paper itself. However, if you need some extra space you use the answer booklet to write your answers.

Marks for each question are indicated.
Suggested Time allocation for Section A: 40 minutes
Total No of Marks for this section: 29

Basic Mathematics Content Knowledge

Section B
Short Answer Questions
(Writing model solutions)

Marks for each question are indicated.
Suggested Time allocation for Section A: 25 minutes
Total No of Marks for this section: 14

Write model solutions for **any two** of the following four questions **in this section**, assuming these be given to the students to emphasize the importance of communicating mathematically when presenting their solutions

Question 1

Find $\frac{dy}{dx}$ for each of the following functions. There is no need to simplify your answers.

(a) $y = (x^2 - \frac{4}{x})^3$

<i>Formula</i>	
<i>Step 1</i>	
<i>Step 2</i>	
<i>Answer</i>	

(3 marks)

(b) $y = \frac{\ln x}{1 - e^{-x}}$

<i>Formula</i>	
<i>Step 1</i>	
<i>Step 2</i>	
<i>Answer</i>	

(4 marks)

Question 2

Consider $D = \begin{bmatrix} 2 & k & k^2 \\ 0 & -1 & k \\ -2 & 1 & 0 \end{bmatrix}$

(a) Evaluate the determinant of D

<i>Formula</i>																			
<i>Step 1</i>																			
<i>Step 2</i>																			
<i>Answer</i>																			

(4 marks)

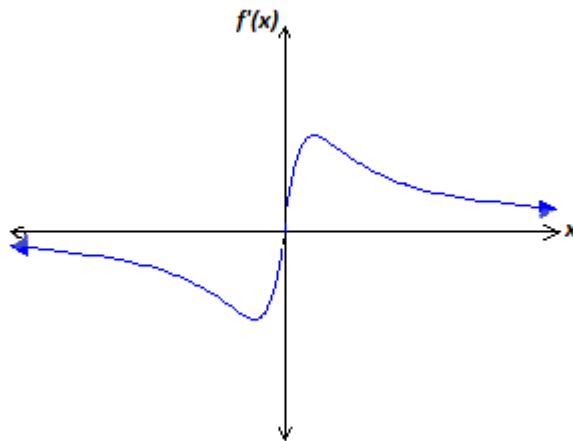
(b) Hence determine the value(s) of k for which the matrix D has no inverse.

<i>Explanation:</i>																			
When does a matrix not have an inverse?																			
<i>Step 1</i>																			
<i>Step 2</i>																			
<i>Answer</i>																			

(3 marks)

Question 3

The graph of the derivative $y = f'(x)$ is shown below:



- (a) The graph passes through the origin O . What does this tell you about the graph of $y = f(x)$

<p>Explanation: <i>Values of the (x,y) at origin; what does it mean in relation to the above graph How it relates to $y = f(x)$</i></p>	

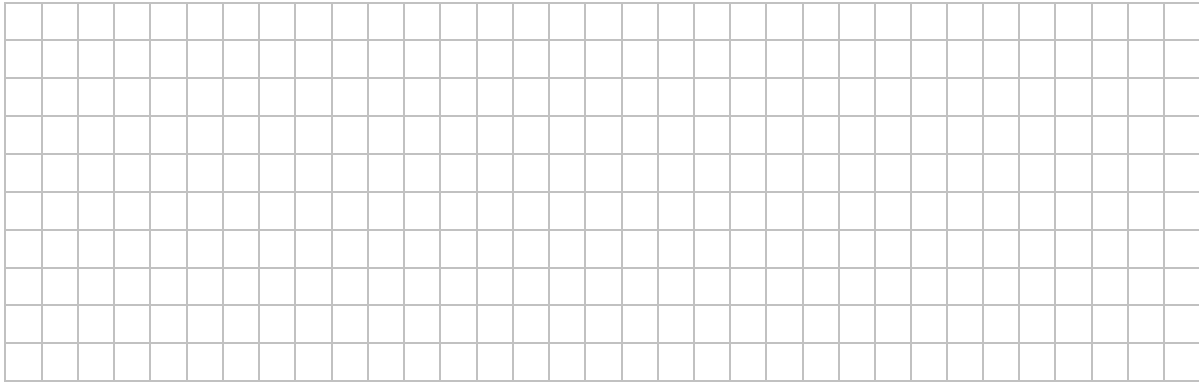
(3 marks)

- (b) On the graph above, mark and label any points where (second derivative) $f''(x) = 0$ What do these points tell you about the graph of $y = f(x)$

<p>Explanation: <i>What is the connection between the key points on the graph and the derivative?</i></p>	

(4 marks)

Clearly one solution is not 'complete'. How would you explain this to the concerned student with a focus on what conceptual misunderstanding the student might be having?



(5 marks)

Question 5

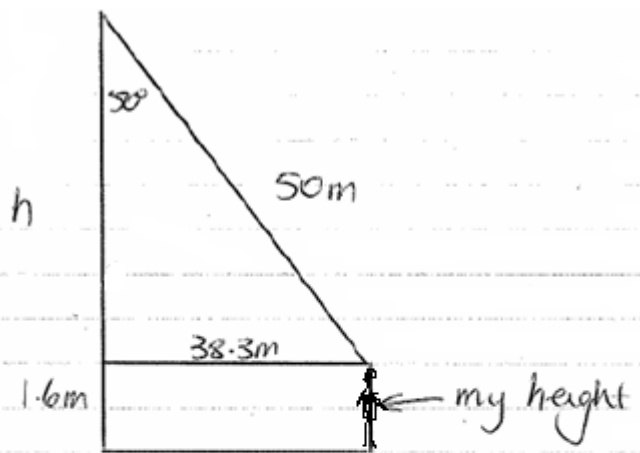
Fred has purchased himself a box kite so he can participate in the Bachelor Bay Kite Festival. The packaging on the kite states that the kite string will form an angle of 50° to the vertical when the kite is flying and the string is tight.

Fred wonders how high the kite will fly when he uses 50 meters of kite string. At noon, when the sun is directly overhead, Fred gets his friend Barlow to measure the distance along the ground between himself and the shadow of the kite.

Fred constructs the following diagram and uses Pythagoras Theorem, as shown, to find the height of the kite.



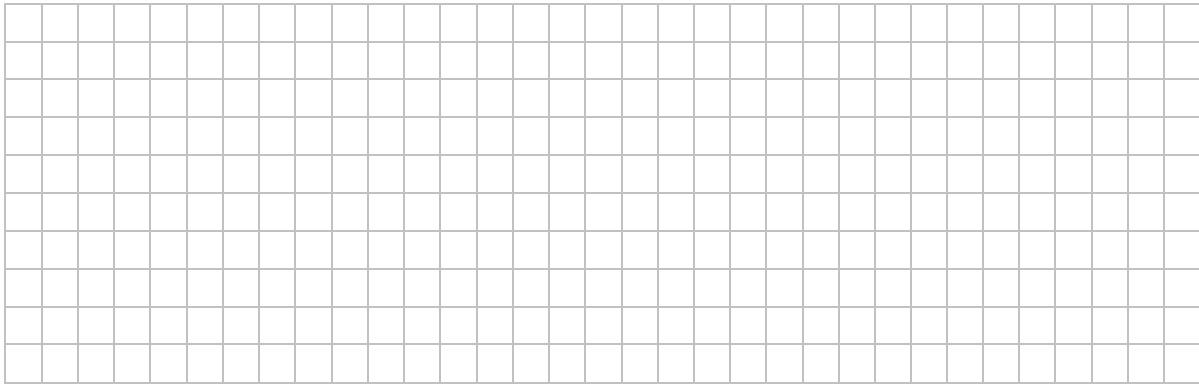
Image source:
<https://au.pinterest.com/roberts0162/flight-kites/>



$$\begin{aligned} \text{base}^2 + \text{height}^2 &= \text{hyp}^2 \\ 38.3^2 + 50^2 &= h^2 \\ 3966.89 &= h^2 \\ h &= 62.98 \text{ m.} \end{aligned}$$

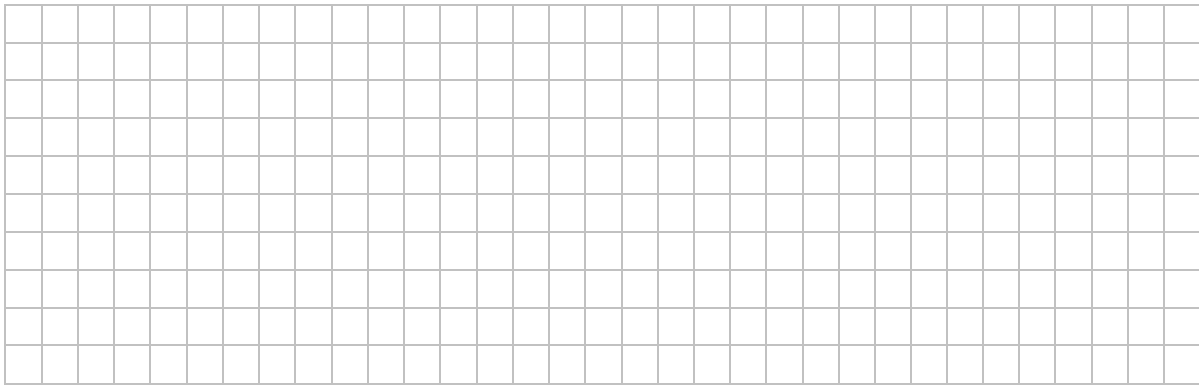
$$\begin{aligned} \text{Overall height} &= 62.98 \text{ m} + 1.6 \text{ m} \\ &= 64.58 \text{ m} \end{aligned}$$

a. Explain to Fred why the height of the kite that Fred calculated is unrealistic.



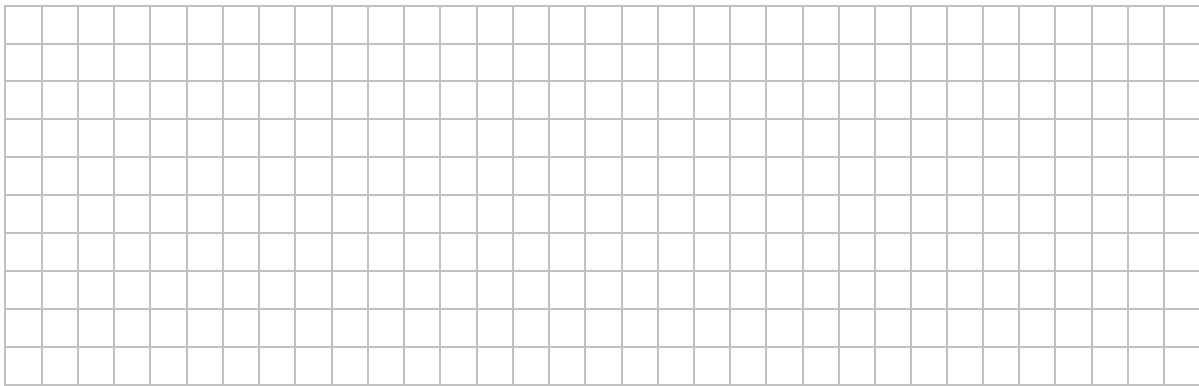
(2 marks)

b. Make the appropriate corrections to Fred's working to find the correct height of the kite.



(2 marks)

c. Show Fred another method to find the height of the kite.



(4 marks)

Extra Space if needed

