

Assessment Task Notification

RESPECT | RESPONSIBILITY | PERSONAL BEST



Faculty: Maths	Course: Mathematics Extension 1	Time allowed: 10 weeks
Teacher: Mr Matt Pascoe	Email: matthew.pascoe1@det.nsw.edu.au	
Task number: 1	Title: Investigative Assignment	
Year: 12	Due date: 2 nd April 2024	Weighting: 20%

Syllabus outcomes assessed:

ME12-1 applies techniques involving proof or calculus to model and solve problems

ME12-2 applies concepts and techniques involving vectors and projectiles to solve problems

ME12-3 applies advanced concepts and techniques in simplifying expressions involving compound angles and solving trigonometric equations

ME12-4 uses calculus in the solution of applied problems, including differential equations and volumes of solids of revolution

ME12-5 applies appropriate statistical processes to present, analyse and interpret data

ME12-6 chooses and uses appropriate technology to solve problems in a range of contexts

ME12-7 evaluates and justifies conclusions, communicating a position clearly in appropriate mathematical forms

21st Century and employment related skills:

<input checked="" type="checkbox"/>	Communication	<input checked="" type="checkbox"/>	Use of technology
<input checked="" type="checkbox"/>	Critical Thinking	<input checked="" type="checkbox"/>	Self-reflection and refinement
<input checked="" type="checkbox"/>	Creativity	<input checked="" type="checkbox"/>	Problem Solving
<input checked="" type="checkbox"/>	Collaboration	<input checked="" type="checkbox"/>	Initiative and Enterprise
<input checked="" type="checkbox"/>	Planning and Organising	<input type="checkbox"/>	Cross-Cultural Understanding

Task description:

Compose an Interest Piece that connects a mathematical concept in the Mathematics Extension 1 course to a novel concept or context of your choice. For instance, your Interest Piece could explore:

- *History* – tell the mathematical story behind how a piece of mathematics developed into the version that you have learned.
- *Application* – give a worked example of how Mathematics Extension 1 knowledge or problem-solving techniques can be used to solve a real-world problem that we have not explored within the course.
- *Extension* – explain how a mathematical idea unlocks new techniques that can solve more sophisticated kinds of problems.
- *Upskill* – Upskill the class on a coming concept from the Year 12 course

You will also be required to provide feedback to one of your peers using the Peer feedback form.

Assessment criteria:

You will be assessed on your ability to:

Your Interest Piece should demonstrate your knowledge and mathematical communication skills, including your ability to:

- choose appropriate strategies to construct persuasive mathematical arguments

- apply mathematical techniques and concepts to communicate ideas
- communicate and justify abstract ideas and relationships using appropriate language, notation and logical argument; and,
- select and utilise technology to enhance your argument and communication

Method of task submission:

On the due date you are required to submit:

- A printed and signed "All My Own Work" declaration
- Your interest piece electronically via Microsoft Teams or a physical copy to the library. Note: If you are planning a live presentation, you will need to upload a video of the presentation to Teams.
- A copy of your peer feedback form that you received from another student.
- A copy of the peer feedback form you provided to another student.

Marking guidelines: Interest Piece

Grade	Descriptor	Mark
E4	<p>Demonstrates sophisticated understanding of mathematics and highly developed communication skills by:</p> <ul style="list-style-type: none"> ◇ producing a comprehensive, relevant Interest Piece that shows the extensive knowledge, sophisticated multi-step logic and mathematical insight appropriate to the course ◇ providing a persuasive argument to prove results with the final product presented with the highest possible production values ◇ effectively communicating a new concept to an audience ◇ utilising appropriate algebraic, diagrammatic, and graphical techniques, concise notation, and clear logical argument ◇ synthesising mathematical techniques, results, and ideas creatively ◇ evaluating and discussing the implications of mathematical concepts in a broader context than the ones presented during lessons ◇ correctly identifying and linking your presentation to syllabus content 	16-20
E3	<p>Demonstrates a strong understanding of mathematics and well-developed communication skills by:</p> <ul style="list-style-type: none"> ◇ producing a relevant Interest Piece that shows excellent knowledge, strong multi-step logic and mathematical insight appropriate to the course ◇ providing a persuasive argument to prove results with the final product presented to a high quality ◇ effectively communicating a new concept to an audience ◇ utilising appropriate algebraic, diagrammatic, and graphical techniques ◇ discussing the implications of mathematical concepts in a broader context than the ones presented during lessons ◇ making a reference to the syllabus content covered in your presentation 	11-15
E2	<p>Demonstrates a basic understanding of mathematics and reasonable communication skills by:</p> <ul style="list-style-type: none"> ◇ composing an Interest Piece related directly or indirectly to the skills and concepts of the course ◇ providing an argument to prove results with some attempt to produce a good quality final product ◇ attempting to communicate a new concept to an audience ◇ utilising basic algebraic, diagrammatic, and graphical techniques ◇ describing mathematical thought in a brief and rudimentary way ◇ Minimal connection with the relevant syllabus content 	6-10
E1	<p>Demonstrates a basic understanding of mathematics and limited communication skills by:</p> <ul style="list-style-type: none"> ◇ composing an Interest Piece related directly or indirectly to the course 	1-5

	<ul style="list-style-type: none"> ◇ attempting to utilise basic algebraic, diagrammatic, and graphical techniques ◇ producing a derivative presentation ◇ not linking to the syllabus content covered 	
N (Stages 5 and 6)	Non-attempt	0

Marking guidelines: Peer Feedback

Grade	Descriptor	Mark
E4	<p>Demonstrates sophisticated understanding of mathematics and highly developed communication skills by:</p> <ul style="list-style-type: none"> ◇ Identifying or choose appropriate strategies to support Mathematical arguments and proofs with extensive evidence of why they are the most appropriate. ◇ Identifying or recommend appropriate mathematical techniques and concepts to model problems providing supporting evidence ◇ Identifying and suggest appropriate language, notation, and logical arguments with strong evidence to support 	8-10
E3	<p>Demonstrates a basic understanding of mathematics and reasonable communication skills by:</p> <ul style="list-style-type: none"> ◇ Identifying or suggest the use of a strategy to support mathematical arguments and proofs including some evidence ◇ Identifying or recommend a mathematical techniques or concept to model problems with limited evidence ◇ Identifying and suggest some language, notation, and logical arguments with some evidence to support 	4-7
E2/E1	<p>Demonstrates a limited understanding of mathematics and minimal communication skills by:</p> <ul style="list-style-type: none"> ◇ Showing a limited knowledge of identified strategies to support mathematical arguments and proofs ◇ Showing a limited awareness of the mathematical techniques or concepts utilized ◇ Showing a limited language, notation and logical arguments identified 	1-3
N (Stages 5 and 6)	Non-attempt	0



Mathematics Extension 1 | Interest Piece – Assessment Task 1

1 Overview

As the highest level of mathematical study offered to students in the HSC, Mathematics Extension 1 occupies a unique place in developing the qualities of present and future mathematicians. The rationale for the course states:

This course provides students with the opportunity to develop thorough knowledge, understanding and skills in working mathematically and in communicating concisely and precisely. Students have the opportunity to develop rigorous mathematical arguments and proofs and use mathematical models extensively. Students develop their awareness of the interconnected nature of mathematics, its beauty and its functionality.

This task provides an opportunity for you to fully experience and investigate the intrinsic value outlined above.

2 Task Requirements

Compose an Interest Piece that connects a mathematical concept in the Mathematics Extension 1 course to a novel concept or context of your choice. For instance, your Interest Piece could explore:

- *History* – tell the mathematical story behind how a piece of mathematics developed into the version that you have learned.
- *Application* – give a worked example of how Mathematics Extension 1 knowledge or problem-solving techniques can be used to solve a real-world problem that we have not explored within the course.
- *Extension* – explain how a mathematical idea unlocks new techniques that are capable of solving more sophisticated kinds of problems.
- *Upskill* – Upskill the class on a coming concept from the Year 12 course not taught prior to the due date.

Your Interest Piece should demonstrate your knowledge and mathematical communication skills, including your ability to:

- choose appropriate strategies to construct persuasive mathematical arguments
- apply mathematical techniques and concepts to communicate ideas
- communicate and justify abstract ideas and relationships using appropriate language, notation and logical argument
- select and utilise technology to enhance your argument and communication

Your final submission can be presented in any suitable medium you choose, including but not limited to:

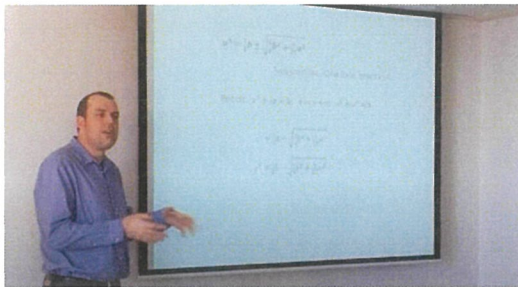
- A written paper
- A live presentation
- A video

Your Interest Piece should be carefully prepared for submission. As there is a degree of choice in your presentation, there is a minimum requirement of 10 minute presentation or the equivalent of 5 pages of writing (excluding diagrams etc) not a fixed word or time limit.

You should choose your medium carefully as every format has its own advantages and disadvantages. It is your role to consider and balance these appropriately. Lenience will not be provided if the ideas in your submission are unclear owing to the limitations of the format you have selected. We strongly recommend that you determine the material that you intend to explore first, and then determine the medium that can most effectively convey the key ideas and concepts within that material.

Examples

- Book: Infinite Powers by Steve Strogatz (Archimedes parabola example)
- [Gavin Sinclair \(Duels and Secrets\)](#)



- [Mathologer: "Why is doubling cubes and squaring circles impossible?"](#)

$a + b\sqrt{7}$
RATIONAL

ASSUME
 $a + b\sqrt{7}$ solves $x^3 = 2$
 \downarrow
 $a - b\sqrt{7}$ solves $x^3 = 2$

- [Mark Rober: "BEST Guess Who Strategy – 96% WIN record using MATH"](#)

That's looking substantially better. The series inside the brackets is what I'm interested in most; it's now clear that it's a function in x . So I could write this:

$$f(x) = 1 + x + \frac{(x)^2}{2!} + \frac{(x)^3}{3!} + \frac{(x)^4}{4!} + \frac{(x)^5}{5!} + \frac{(x)^6}{6!} + \frac{(x)^7}{7!} + \dots$$

$$f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \frac{x^6}{6!} + \frac{x^7}{7!} + \dots$$

So now the Taylor series has been brought to the fore. But what is it? Remembering that Taylor Series are heavily dependent on calculus, it would be interesting to differentiate this polynomial & see if it can yield any insights.

Wait... what? We differentiated $f(x)$ and got back the original function. In the business, that's what they call a "smoking gun." There's no doubt about it: if $f(x) = f'(x)$, then $f(x) = e^x$.

- [Mr. Woo: Taylor Series](#)

A Grade Student Sample

<https://www.youtube.com/watch?v=F4wmfBx0v4U>

<https://docs.google.com/presentation/d/1qVidWEVp-TGSYGS-1nm-1nYSKrHBrykr/edit#slide=id.p15>

3 Timeline and Peer Review

What's Due	When
Confirm Topic Choice with teacher	Tuesday 13 th February
Submit Draft plan teacher	Tuesday 5 th March
Completed interest piece ready for peer feedback	Tuesday 19 th March
Reviewer provide feedback to peer	Tuesday 26 th March
Final Submission of assessment	Tuesday 2 nd April

Note: If you are planning a live presentation, you will need to upload a rough video of the presentation to teams.

Assessment Notification	Confirm topic with Mr Pascoe	Submit draft plan to teacher	Have interest piece for peer feedback	Reviewers provide feedback to peer	Submit final Interest Piece
Week 2 Term 1	Week 3 Term 1	Week 6 Term 1	Week 8 Term 1	Week 9 Term 1	Week 10 Term 1

4 Assessed outcomes

This task assesses the following course outcomes:





ME12-6	chooses and uses appropriate technology to solve problems in a range of contexts
ME12-7	evaluates and justifies conclusions, communicating a position clearly in appropriate mathematical forms





5 What to Submit


On the due date you should submit:

- A printed and signed "All My Own Work" declaration (see final page).
- Submit your interest piece electronically via teams or a physical copy. Or a printed copy of your video or live presentation transcript (if appropriate). Note: These can be automatically generated.
- An electronic copy of your Feedback (via Teams). You do NOT need to provide a printed copy of this feedback.
- An electronic copy of the Reviewers feedback you provided.

6 Feedback Form

	Scale	Comments/Evidence/Examples to support
The Interest Piece was easy to understand and engaging.		
This piece developed my understanding of the content presented.		
The notation, diagrams and graphs used were clear and relevant.		
I understood the context of the Interest Piece.		

<p>The Interest Piece flows logically and has been presented with care.</p>		
<p>The formatting is correct and consistent throughout (if appropriate).</p>		
<p>Spelling and grammar are correct throughout the task.</p>		
<p>Images and diagrams must be referenced in the content and be relevant and reflective</p>		

All sources are referenced when used and a bibliography provided.		
What did you find interesting about this piece?		
Overall comments or suggestions for improvement:		

7 Marking criteria- Interest Piece

Projects will be assessed on the following criteria:

- Accuracy and quality of mathematics presented
- Innovative approach to presenting mathematics
- Creativity and clarity of communication

Level of competence demonstrated	Marks
Demonstrates sophisticated understanding of mathematics and highly-developed communication skills by: <ul style="list-style-type: none">◇ producing a comprehensive, relevant Interest Piece that shows the extensive knowledge, sophisticated multi-step logic and mathematical insight appropriate to the course◇ providing a persuasive argument to prove results with the final product presented with the highest possible production values◇ effectively communicating a new concept to an audience◇ utilising appropriate algebraic, diagrammatic and graphical techniques, concise notation and clear logical argument◇ synthesising mathematical techniques, results and ideas creatively◇ evaluating and discussing the implications of mathematical concepts in a broader context than the ones presented during lessons◇ correctly identifying and linking your presentation to syllabus content	16-20
Demonstrates a strong understanding of mathematics and well-developed communication skills by: <ul style="list-style-type: none">◇ producing a relevant Interest Piece that shows excellent knowledge, strong multi-step logic and mathematical insight appropriate to the course◇ providing a persuasive argument to prove results with the final product presented to a high quality◇ effectively communicating a new concept to an audience◇ utilising appropriate algebraic, diagrammatic and graphical techniques◇ discussing the implications of mathematical concepts in a broader context than the ones presented during lessons◇ making a reference to the syllabus content covered in your presentation	11-15
Demonstrates a basic understanding of mathematics and reasonable communication skills by: <ul style="list-style-type: none">◇ composing an Interest Piece related directly or indirectly to the skills and concepts of the course◇ providing an argument to prove results with some attempt to produce a good quality final product◇ attempting to communicate a new concept to an audience◇ utilising basic algebraic, diagrammatic and graphical techniques◇ describing mathematical thought in a brief and rudimentary way◇ making a minimal connection with the relevant syllabus content	6-10
Demonstrates a basic understanding of mathematics and limited communication skills by: <ul style="list-style-type: none">◇ composing an Interest Piece related directly or indirectly to the course◇ attempting to utilise basic algebraic, diagrammatic and graphical techniques◇ producing a derivative presentation◇ presenting no link to the syllabus content covered	1-5
Non-attempt	0

8 Marking criteria- Peer Feedback

Feedback will be assessed on the following criteria:

- Identify the use of appropriate technology to solve problems in a range of contexts
- Identify and evaluate the justification of conclusions

Level of competence demonstrated	Marks
Demonstrates sophisticated understanding of mathematics and highly-developed communication skills by: <ul style="list-style-type: none">◇ Identifying or choose appropriate strategies to support Mathematical arguments and proofs with evidence of why they are the most appropriate.◇ Identifying or recommend appropriate mathematical techniques and concepts to model problems providing supporting evidence◇ Identifying and suggest appropriate language, notation and logical arguments with strong evidence to support	8-10
Demonstrates a basic understanding of mathematics and reasonable communication skills by: <ul style="list-style-type: none">◇ Identifying or suggest the use of a strategy to support mathematical arguments and proofs including some evidence◇ Identifying or recommend a mathematical techniques or concept to model problems with limited evidence◇ Identifying and suggest some language, notation and logical arguments with some evidence to support	4-7
Demonstrates a limited understanding of mathematics and minimal communication skills by: <ul style="list-style-type: none">◇ Presenting a limited knowledge of identified strategies to support mathematical arguments and proofs◇ Presenting a limited awareness of the mathematical techniques or concepts utilized◇ Presenting a limited language, notation and logical arguments identified	1-3
Non-attempt	0