

## Goals



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Unit goals for Mathematical Methods:

- understand the concepts and techniques in algebra, functions, graphs, trigonometric functions and probability
- solve problems using algebra, functions, graphs, trigonometric functions and probability
- apply reasoning skills in the context of algebra, functions, graphs, trigonometric functions and probability
- interpret and evaluate mathematical information and ascertain the reasonableness of solutions to problems
- communicate their arguments and strategies when solving problems.

**This week:**

- **Differentiation Review**

## Theoretical Components

**Resources:**

- Maths Quest Year 12 Chapter 7

**Knowledge Checklist from last year:**

- what is a rate?
- constant rates
- variable rates
- average rates of change
- instantaneous rates of change
- interpret graphs that illustrate rates of change
- equations of tangents/normals
- what is a limit?
- evaluating limits
- what is a gradient function?
- what is the x-intercept of a gradient function?
- power rule
- finding gradient functions by sketching
- finding gradient functions by using the rule
- finding gradient functions using your CAS
- sketching polynomials using stationary points
- finding maximum and minimum points and to solve problems in a practical context
- investigate speed, displacement and velocity
- primitive functions and applications

## Practical Components

**Do the following questions:**

Organise your solutions neatly in your exercise book.

**Maths Quest Year 12 Chapter 7** (see GC)

**Ex 7C – The derivative of  $x^n$**

Every 2<sup>nd</sup> question

**10 Quick Questions** (see the following page)

## Investigation

See separate page

(20 marks – see rubric)

**QFO**

Quiz/Forum/Other

Remember to check [hawkermaths.com](http://hawkermaths.com) for each week's learning brief.

Make sure you have joined Google Classroom and Mathspace. If you have not, see your teacher.

## 10 QUICK QUESTIONS

### CRASH COURSE

### Differentiation

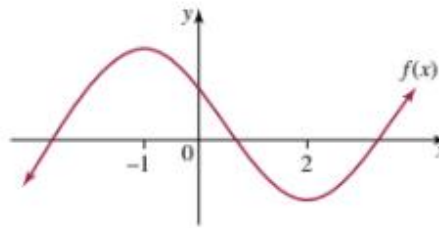
- If  $A = (3, 7)$  and  $B = (9, 4)$ , find:
  - the gradient of  $AB$
  - the equation of  $AB$ .
- Evaluate the following.
  - $\lim_{x \rightarrow 3} (5x + 2)$
  - $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$
- Differentiate the following with respect to  $x$ .
  - $y = 3x^2$
  - $y = -8x^3 + 10$
  - $y = x^2(x + 4)$
  - $y = \frac{2x^5 + x^4}{x^2}$
- If  $y = 3x^2 - 4x + 8$ , find  $\frac{dy}{dx}$  at  $x = 1$ .
- If  $f(x) = 4x - x^2$ , find:
  - $f'(x)$
  - $f'(3)$
  - $x$  such that  $f'(x) = 0$ .
- Consider  $y = x^2 + 2x + 4$ . Find the coordinates of the point where the gradient of the tangent to the curve is 6.
- Consider the graph of the function  $y = x^2$ . State the values of  $x$  for which the function has:
  - a positive slope
  - a negative slope
  - a zero slope.
- The points  $A$  and  $B$  lie on the curve of  $y = 3x - x^2$ . If the  $x$ -values of the coordinates of  $A$  and  $B$  are 1 and  $(1 + h)$  respectively, find the gradient of the chord  $AB$ .
- Consider the function  $y = \begin{cases} 1 - x, & x < 0 \\ x, & x \geq 0 \end{cases}$ .
  - Sketch the graph of  $y$ .
  - Is this a continuous function?
  - Is the function differentiable at  $x = 0$ ?
- Consider the function  $f(x) = x^2 - 4x$ .
  - Sketch  $y = f(x)$ , showing all key features.
  - Find  $f'(x)$ .
  - Sketch on the same graph  $y = f'(x)$ .

**MM3 2021 Week 1 Investigation**

1.

a The figure at right has a positive gradient where:

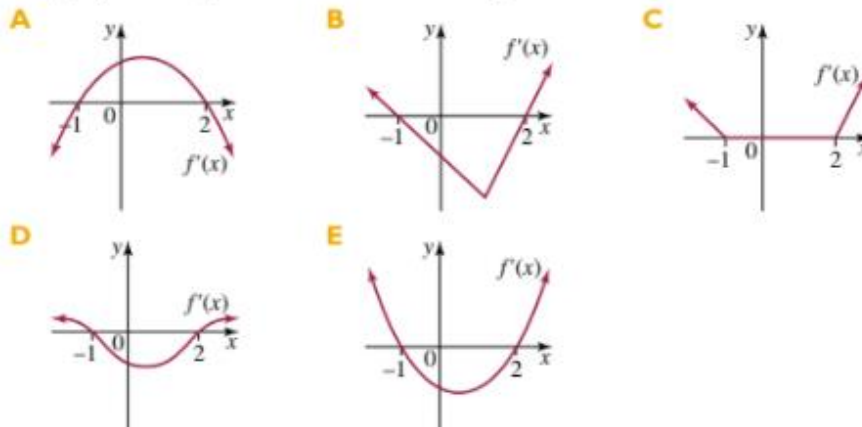
- A  $-1 < x < 2$
- B  $x < -1$  only
- C  $x > 2$  only
- D  $x < -1$  and  $x > 2$
- E  $x > 0$



b The figure above has a negative gradient where:

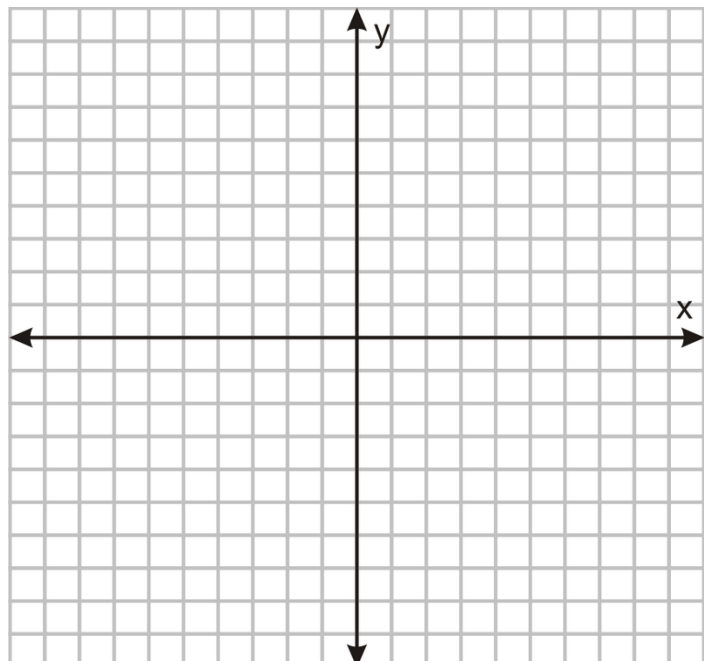
- A  $x > -1$
- B  $x < 2$
- C  $-1 < x < 2$
- D  $x < -1$  and  $x > 2$
- E  $x < 0$

c The graph of the gradient function for the figure above is:



2. On the cartesian plane provided, sketch a continuous  $y = f(x)$  having all the following properties:

- $f(-4) = 6, f(0) = 3, f(4) = 0,$
- $f'(-4) = f'(4) = 0,$
- $f'(x) < 0$  for  $-4 < x < 4$  and,
- $f'(x) > 0$  for  $x < -4$  and  $x > 4.$





**Marking Rubric**

Name: \_\_\_\_\_

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
<b>Practical</b>	Student completes practical work, including exercises and Mathspace task, of the brief to an acceptable standard set by the teacher.	2	3		/6
<b>Investigation Task</b>	Student completes the investigation task of the brief to an acceptable standard set by the teacher.	2	2		/4
<b>Reasoning and Communications</b>	Student responses are accurate and appropriate in presentation of mathematical ideas, with clear and logical working out shown.	4	-		/4
<b>Concepts and Techniques</b>	Student submitted work selects and applies appropriate mathematical techniques to solve practical problems and demonstrates proficiency in the use of mathematical facts, techniques and formulae.	4	-		/4
	<b>Submission Guidelines</b>				
<b>Timeliness</b>	Student submits the exercises, Mathspace task (if applicable) and investigation by the set deadline. See scoring guidelines for specific details.	2	-		/2
				<b>FINAL</b>	<b>/20</b>

**Student Reflection:**

How did you go with this week's work?

What did you learn?

What did you find easy?

What do you need to work on?

**Mathspace task score (if applicable):**