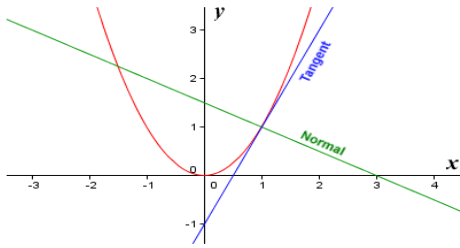


# Goals



This week we are:

- Finding limits of functions and using limit theorems
- Finding gradient function from first principle
- Differentiating using first principles

# Theoretical Components

## Resources:

- Maths Quest Year 11 Chapter 9

## Knowledge Checklist:

- 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
- 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

## Video

[Definition of the derivative as a limit](#)

[Example of using first principles](#)

# Practical Components

Maths Quest Year 11 Chapter 9 (see pdf – GC)

## Ex 9C Differentiation using first principles

- Q's 1 (a, b), 3, 5 (a,c), 6

# Investigation

See the following pages

(20 marks – see rubric)

## Part 1

For the following functions  $f(x) = 3x - 1$ ,  $f(x) = 3x + 4$  and  $f(x) = 3x + 1$

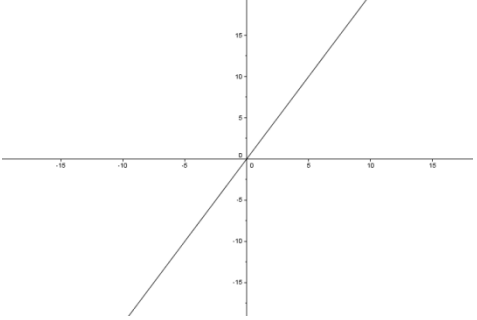
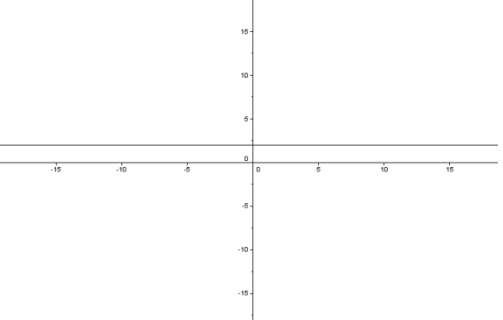
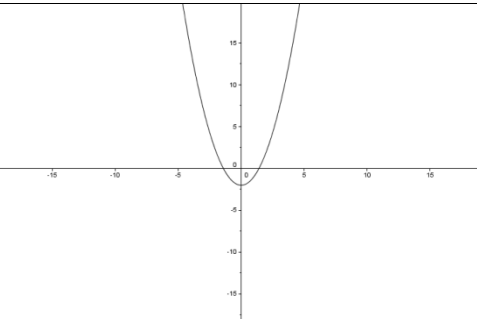
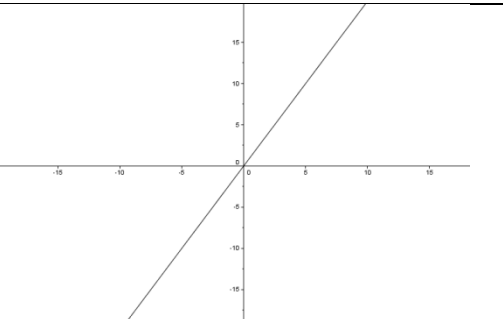
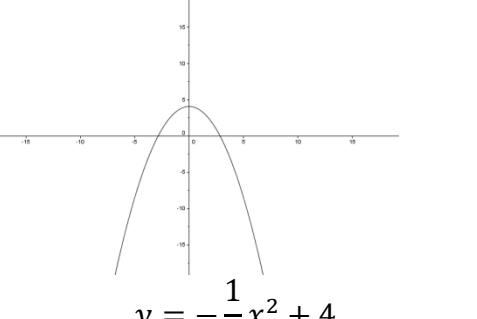
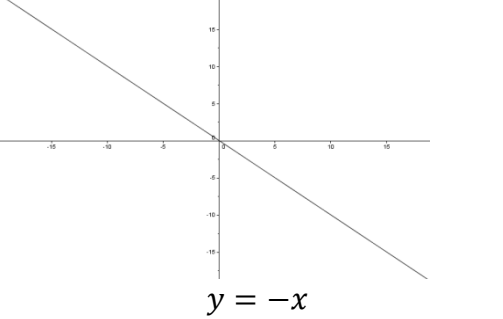
(a) Find the derivative for all three using first principles.

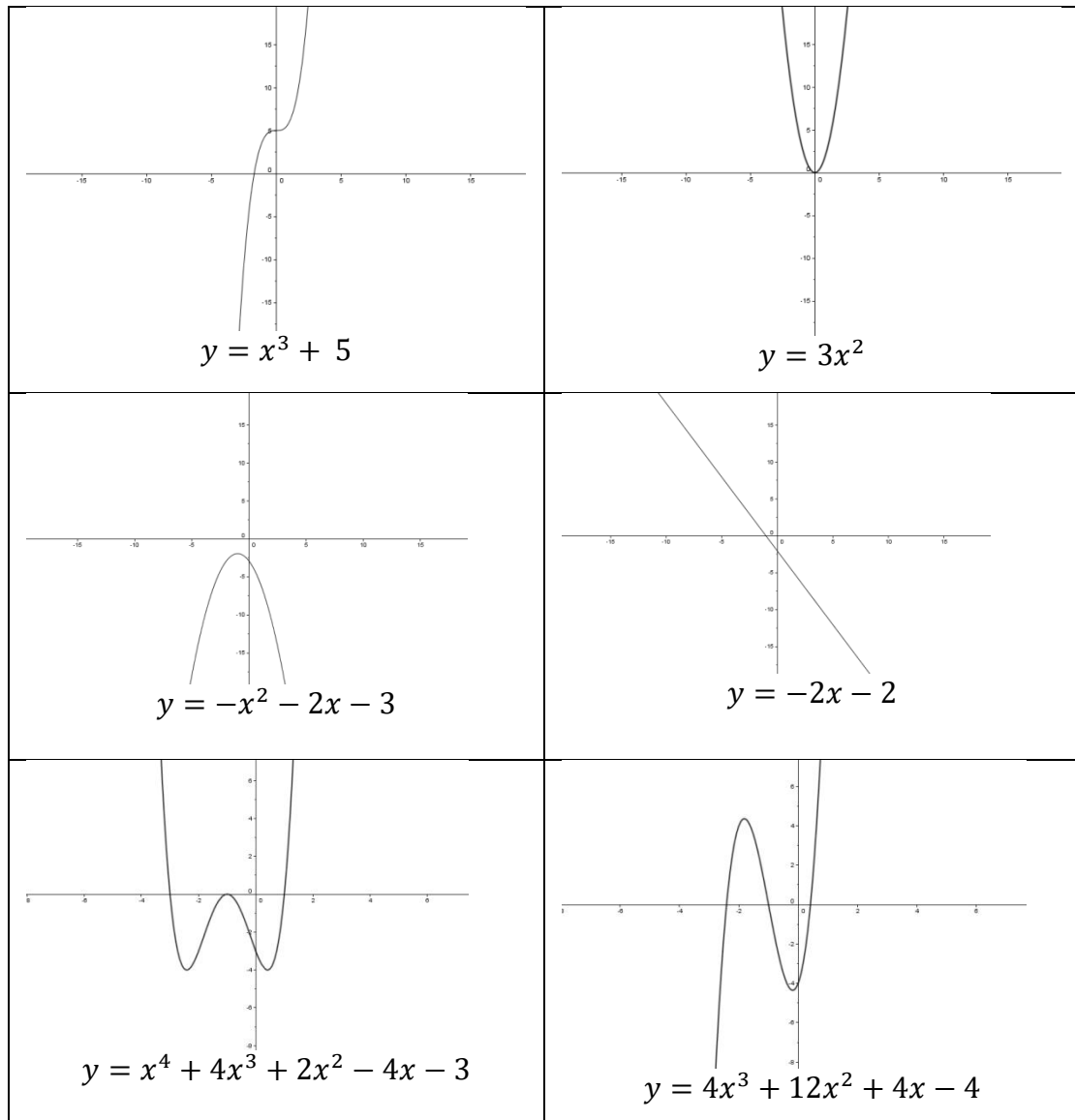
(b) What do you notice?

(c) Why is this the case? Prove your answer by graphing the functions.

## Part 2

Here are the graphs of some functions, and their matching "gradient functions".

FUNCTION	GRADIENT FUNCTION
 <p style="text-align: center;"><math>y = 2x</math></p>	 <p style="text-align: center;"><math>y = 2</math></p>
 <p style="text-align: center;"><math>y = x^2 - 2</math></p>	 <p style="text-align: center;"><math>y = 2x</math></p>
 <p style="text-align: center;"><math>y = -\frac{1}{2}x^2 + 4</math></p>	 <p style="text-align: center;"><math>y = -x</math></p>



Can you see a pattern?

ie.

- Can you see the correlation between the value of the gradient, whether it is positive or negative, and the original curve?
- What is special about the x-intercepts of the gradient function?
- What is the relationship between the degree of the polynomials?

Develop a rule for finding the gradient function of  $y = ax^n$



## Marking Rubric

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

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
<b>Practical</b>	Student completes practical work, including exercises and Mathspace task (if applicable), 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):**