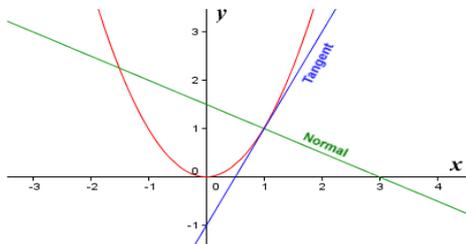


## Goals

This fortnight we are:

- Finding equations of tangent lines
- Relating the gradient function to the original function
- Informally finding the rule for the gradient function



## Theoretical Components

Make notes on the following chapters and website:

### Maths Quest 11 Mathematical Methods

- 9A - Introduction to limits
- 9B - Limits of discontinuous, rational and hybrid functions
- 9C - Differentiation using first principles

### Knowledge Checklist:

- what is a rate?
- constant and variable rates
- average and 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?
- finding gradient functions by sketching, using the rule, or using your CAS
- finding gradient functions using your CAS

## Practical Components

### Do the following questions:

Organise your solutions neatly in your exercise book.

You will require Chapter 9 of Maths Quest 11 Mathematical Methods (pdf – Google Classroom)

- 9A: 1-8, 10-12
- 9B: 1-4, 7a, 7c, 8a, 8c, 9b, 9d, 9f
- 9C: 1a, 1b, 2a, 2c, 3, 5a, 5c, 6

Mathspace task

## Investigation

See the following page

Other

## Week 10 Investigation

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 principle.
  - b. What do you notice?
  - c. Why is this the case? Prove your answer by graphing these functions.
  
2. Let  $P(a, a^2)$  be any point on the curve  $y = x^2$ , then the line  $l$  through  $P$  with gradient  $m$  has equation  $y - a^2 = m(x - a)$ .
  - a. Show that the x-coordinates of the points where  $l$  meets the curve are  $x = a$  and  $x = m - a$ .
  - b. What is  $l$  in relation to the function  $y$  if these two points coincide.
  - c. Find the value of the gradient  $m$  for which these two points coincide and explain why it follows that the derivative of  $x^2$  is  $2x$ .