

## UNIT 8

### DIFFERENTIATION, (SYLLABUS REF: 7.1-7.6)

**Aim:** Be able to differentiate different basic functions. Understand differentiation as finding the *gradient function* and, hence, find equation of tangents and normals. Also understand and use some applications of differentiation, to solve problems including rate of change and optimization.

#### **Objective:**

- Understand the difference between *average* change and *instantaneous* change.
- Understand the concept of a tangent.
- Understand the gradient of a tangent as the instantaneous change.
- Use and understand the notations of a derivative function;  $f'(x) = \frac{dy}{dx}$
- The procedure of differentiation, the rules, for different functions, including rational functions. (“Finding the gradient function”, “finding the derivative function”).
- The procedure of finding the gradient of a tangent for a given x-value.
- The procedure of finding the equation of a tangent for a given x-value without calculator.
- The procedure of finding the equation of a tangent for a given x-value with calculator.
- The procedure of finding the x-value at a point on a graph when the gradient of a tangent is given.
- The procedure of finding the coordinates at a point on a graph when the gradient is given.
- Understand when a function is increasing and when it is decreasing.
- Understand that at a stationary point the gradient of a tangent is zero.
- Interpretation of:  $f'(x) > 0$ ,  $f'(x) = 0$ ,  $f'(x) < 0$
- Express in algebraic form, using inequality signs, the intervals where a function is increasing and decreasing.

- Understand and interpret the concept of a sign diagram for determining increasing/decreasing intervals and stationary points.
- Be able to make a sign diagram from appropriate information.
- The procedure of finding stationary points;  $f'(x) = 0$
- Solve problems which includes optimization.
- Solve problems which includes rates of change.

### **TOK links**

The differences in averages, depending on the interval we use. To make the interval infinitely small.

Different ways of drawing tangents on a graph depending on the scale.

### **ATL**

Videos on procedures and concepts.

Investigation to show different gradients on the function  $y = x^2$ .

Work on and discuss examination questions.

### **Assessment**

Formative: Homework quizzes and exit tags.

Summative: Included in the test examination, December 9.