Mathematics: Analysis and Approaches SL 7,8 Unit Plan

Topic: Calculus – Suggested teaching hours: 28

1. Introduction to the concept of a limit; derivative interpreted as gradient function and as rate of change.

2. Increasing and decreasing functions: graphical interpretation of $f'(x)>0$, $f'(x) = 0$, $f'(x)<0$.

3. Derivative of functions of the form $f(x) = ax^n + bx^{n-1} + \cdots, n \in Z$.

4. Tangents and normal at a given point, and their equations.

5. Introduction to integration as anti-differentiation of functions of the form $f(x) = ax^n + bx^{n-1} + \cdots, n \in Z, n \neq -1$; definite integrals using technology; areas between a curve y = f(x) and the x-axis, where f(x) > 0; anti-differentiation with a boundary condition to determine the constant term.

6. Derivative of x^n where $n \in Q$, sinx, cosx, e^x, and lnx; differentiation of a sum and a multiple of these functions; the chain rule for composite functions; the product and quotient rules.

7. The second derivative; graphical behavior of functions, including the relationship between the graphs of f, f ', and f ".

8. Local maximum and minimum points; testing for maximum and minimum; optimization; points of inflexion with zero and non-zero gradients.

9. Kinematic problems involving displacement s, velocity v, acceleration a and total distance travelled.

10. Indefinite integral of x^n where $n \in Q$, sinx, cosx, $\frac{1}{x}$, $and\ e^x$; the composites of any of these with the linear function ax + b; integration by inspection (reverse chain rule) or by substitution for expressions of the form $kg'(x)f(g(x))dx$.

11. Definite integrals, including analytical approach; areas between a curve y=f(x) and the x-axis, where f(x) can be positive or negative, without the use of technology; area between curves.