

UNIT 4 SPECIALIST MATHS

BOOK 1

Formula List

Partial Fractions

Differential Equations

Verifying Solutions

Solving First Order Differential Equations

Type 1: $\frac{dy}{dx} = f(x)$

Integral Form of the Solution to Type 1 Equations

Type 2: $\frac{dy}{dx} = f(y)$

Separation of Variables

Solving Second Order Differential Equations

Summary of Solution Processes

Setting Up and Solving Differential Equations

Simple Exponential Growth and Decay

The Logistic Equation

Newton's Law of Cooling

Input/Output of Mixing Problems

Related Rates

Differential Equations in Other Forms

Numerical Solutions of Differential Equations

Euler's Method

Direction (Slope) Field of a Differential Equation

Kinematics

Displacement, Velocity and Acceleration

Scalars and Vectors

Conversion of Units

Position, Displacement and Distance

Velocity and Speed

Acceleration

Relationships Between Displacement, Velocity and Acceleration

Motion Under Constant Acceleration
Vertical Motion Under Gravity
Velocity-Time Graphs

Setting Up and Solving Differential Equations in Kinematics

The Different Derivative Forms for Acceleration
Types of Problems
Summary
Motion in a Resisting Medium

Vector Calculus

Position Vector as a Function of Time

Converting Parametric Equations into Cartesian Equations

Motion Along the Path of the Particle

Velocity and Acceleration for Motion Along a Curve
Distance Travelled Along a Curve

Summary of Parametric Equations
Conditions for Two Objects to Meet

Differentiation and Anti-Differentiation of a Vector

Notation
Rules: Differentiation
Rules: Anti-Differentiation

Kinematics in Two and Three Dimensions

Position
Velocity
Speed
Acceleration

VCAA Questions – Vector Calculus

Momentum

Mechanics – Dynamics

Units of Force
Conversion of Units
Types of Forces

Weight (Force Due to Gravity)
The Normal Reaction Force
Friction Force
Tension

Drawing Force Diagrams

Newton's Laws of Motion

Net Force

Newton's First Law of Motion

Newton's Second Law of Motion

Newton's Third Law of Motion

Equilibrium of an Object

Two Forces

Three Forces

Lami's Theorem for Static Situations Involving Three Forces

Resolving Forces

Inclined Planes

Applying Newton's Laws of Motion to a System of Objects

Connected Objects

Connected Objects and Gravity

Variable Force

Mixed Mechanics Questions

Mechanics – Statics

Static Friction

Applying Newton's Laws of Motion

Geometric Meaning of Equilibrium

VCAA Questions

Probability and Statistics

Linear Combinations of Random Variables

Sample Means

Simulation of Repeated Random Sampling

Confidence Intervals for the Mean of the Population

Construction of an Approximate Confidence Interval

Hypothesis Testing for a Population Mean

Formulation of a Null Hypothesis and An Alternative Hypothesis