**Sample Course Outline**

Mathematics Methods

ATAR Year 12

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Sample course outline

Mathematics Methods – ATAR Year 12

Unit 3 and Unit 4

Semester 1

| **Week** | **Topic/Syllabus content** | **Assessment** |
| --- | --- | --- |
| 1–2 | **Further differentiation and applications (3.1.1–3.1.16)**  Exponential functions – estimate and identify *e* and establish its derivative, use the exponential growth function and its derivative to solve problems  Trigonometric functions – use geometric constructions, graphical and numerical methods to establish the derivative of sin *x* and cos *x* and use them to solve practical problems |  |
| 3 | Differentiation rules – examine, apply and use the product, quotient and chain rule to differentiate a range of functions | **Task 1** (Week 3) |
| 4–5 | The second derivative and applications of differentiation – identify and apply differentiation techniques and concepts to optimisation problems, rates of change and graph sketching | **Task 2** (Week 5) |
| 6 | **Integrals (3.2.1–3.2.22)**  Anti-differentiation – identify anti-differentiation as a process that reverses differentiation, establish and use notation and formulas and use linearity of anti-differentiation |  |
| 7–8 | Definite integrals and the Fundamental theorem – estimate the area under a curve, link and interpret the limit of sums to area using integrals, examine develop and apply the Fundamental theorem as a link between differentiating and integrating |  |
| 9–10 | Applications of integration – apply techniques of integration to rates of change, area and motion problems | **Task 3** (Week 10) |
| 11–12 | **Discrete random variables (3.3.1–3.3.16)**  General discrete random variables – identify and develop discrete random variables and their associated probability functions, identify parameters and use DRVs to model and solve practical problems |  |
| 13 | Bernoulli distributions – identify and use Bernoulli random variables and associated probabilities, determine parameters and model and solve problems | **Task 4** (Week 13) |
| 14 | Binomial distributions – examine the concept of a binomial random variable, determine associated parameters and probabilities and solve practical problems |  |
| 15 | **Semester 1 examination** | **Task 5**  (Examination week) |

Semester 2

| **Week** | **Topic/Syllabus content** | **Assessment** |
| --- | --- | --- |
| 1–2 | **The logarithmic function (4.1.1–4.1.14)**  Logarithmic functions – define logarithms, establish and use algebraic properties, solve equations and examine features of graphs, interpret and use logarithmic scales and identify suitable contexts to model by logarithmic functions |  |
| 3–5 | Calculus of the natural logarithmic functions – define the natural logarithm and its inverse relationship to *e*, establish and use integrals and derivatives related to the natural logarithm and use them to solve practical problems | **Task 6** (Week 3)  **Task 7** (Week 5) |
| 6–7 | **Continuous random variables and the normal distribution (4.2.1–4.2.7)**  General continuous random variables – examine and use the concepts of a continuous random variable and associated parameters and probabilities in appropriate contexts |  |
| 8–9 | Normal distributions – identify the features of the graph of a normal distribution, calculate probabilities and use these to solve practical problems that are suitable for modelling by normal random variables | **Task 8** (Week 9) |
| 10 | **Interval estimates for proportions (4.3.1–4.3.10)**  Random sampling – examine the concept of randomness and bias and investigate variability of random samples from various distributions |  |
| 11–12 | Sample proportions – examine the concept of the sample proportion and simulate repeated random sampling to illustrate the approximate normality of the distribution of sample proportions for large numbers of samples | **Task 9** (Week 13) |
| 13–14 | Confidence intervals for proportions – examine and use the concept of an interval estimate, define confidence intervals and margins of error and their relationship and use simulation to illustrate variations between samples | **Task 10** (Week 14) |
| 15 | **Semester 2 examination** | **Task 11**  (Examination week) |