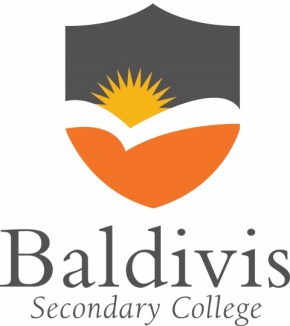
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**Mathematics Methods Unit 3/4 Program 2018**

**TEXT: Nelson Senior Maths- Methods 12 (Student text)**

**Mathematical methods 3/4 AJ Sadler**

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| Semester One | | | | | | |
| Week | Syllabus Entry – Unit 3 | | Textbook Reference | | | Assessment |
| Term 1 | | Sadler | | Nelson | |  |
| 1 | * + 1. examine and use the product and quotient rules     2. examine the notion of composition of functions and use the chain rule for determining the derivatives of composite functions | | Chapter 1 | 1.01  1.02 | |  |
| 2 | * + 1. apply the concept of the second derivative as the rate of change of the first derivative function     2. examine the concepts of concavity and points of inflection and their relationship with the second derivative     3. sketch the graph of a function using first and second derivatives to locate stationary points and points of inflection     4. apply the second derivative test for determining local maxima and minima | | 2A  2B | 3.02  3.03  3.05  3.04 | |  |
| 3 | * + 1. identify acceleration as the second derivative of position with respect to time     2. solve optimisation problems from a wide variety of fields using first and second derivatives     3. use the increments formula: to estimate the change in the dependent variable resulting from changes in the independent variable | | 2C  2D  2E | 3.01  3.06  3.07  3.08  3.09 | |  |
| 4 | 3.2.1 identify anti-differentiation as the reverse of differentiation  3.2.2 use the notation for anti-derivatives or indefinite integrals  3.2.3 establish and use the formula for | | 3A  3B | Chapter 6 | | Test 1 |
| 5 | 3.2.21 determine displacement given velocity in linear motion problems  3.2.22 determine positions given linear acceleration and initial values of position and velocity. | | 3C | Chapter 6 | |  |
| 6 | 3.2.10 examine the area problem and use sums of the form to estimate the area under the curve  3.2.11 identify the definite integral as a limit of sums of the form  3.2.12 interpret the definite integral as area under the curve if  3.2.19 calculate the area under a curve  3.2.13 interpret as a sum of signed areas  3.2.20 calculate the area between curves | | 4A  4B  4C | 4.01  4.02  4.03  4.07  4.04 | |  |
| 7 | 3.2.6 identify and use linearity of anti-differentiation  3.2.14 apply the additivity and linearity of definite integrals   * + 1. calculate total change by integrating instantaneous or marginal rate of change   3.2.15 examine the concept of the signed area function  3.2.16 apply the theorem: , and illustrate its proof  3.2.17 develop the formula and use it to calculate definite integrals geometrically | | 4D  5A  5B | 4.06  7.07  4.05 | |  |
| 8 | 3.1.1estimate the limit of (a^h-1)/h as h→0, using technology, for various values of a >0  3.1.2 identify that e is the unique number a for which the above limit is 1   * + 1. establish and use the formula     2. apply the product, quotient and chain rule to differentiate functions such as     3. use exponential functions of the form and their derivatives to solve practical problems   3.2.4 establish and use the formula | | 6A  6B  6C  6D | 1.03  1.04  Chapter 6 | | Test 2 |
| 9-10 | * + 1. establish the formulas and by graphical treatment, numerical estimations of the limits, and informal proofs based on geometric constructions.     2. apply the product, quotient and chain rule to differentiate functions such as , and     3. use trigonometric functions and their derivatives to solve practical problems | | 7A | 1.05  1.06 | |  |
| 11 | 3.2.5 establish and use the formulas and  3.2.7 determine indefinite integrals of the form  3.2.8 identify families of curves with the same derivative function  3.2.9 determine given and an initial condition | | 7B | Chapter 6 | | Test 3 |
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| Term 2 | | |  |  |  | |
| 1 | **General discrete random variables**  3.3.1 develop the concepts of a discrete random variable and its associated probability function, and their use in modelling data  3.3.2 use relative frequencies obtained from data to obtain point estimates of probabilities associated with a discrete random variable  3.3.3 identify uniform discrete random variables and use them to model random phenomena with equally likely outcomes  3.3.4 examine simple examples of non-uniform discrete random variables  3.3.5 identify the mean or expected value of a discrete random variable as a measurement of centre, and evaluate it in simple cases  3.3.6 identify the variance and standard deviation of a discrete random variable as measures of spread, and evaluate them using technology  3.3.7 examine the effects of linear changes of scale and origin on the mean and the standard deviation  3.3.8 use discrete random variables and associated probabilities to solve practical problems | | 8A  8B | Chapter 2 | | Investigation 2 |
| 2 | **Bernoulli distributions**  3.3.9 use a Bernoulli random variable as a model for two-outcome situations  3.3.10 identify contexts suitable for modelling by Bernoulli random variables  3.3.11 determine the mean and variance of the Bernoulli distribution with parameter  3.3.12 use Bernoulli random variables and associated probabilities to model data and solve practical problems | | 9A | 5.01  5.02 | |  |
| 3 | **Binomial distributions**  3.3.13 examine the concept of Bernoulli trials and the concept of a binomial random variable as the number of ‘successes’ in independent Bernoulli trials, with the same probability of success in each trial  3.3.14 identify contexts suitable for modelling by binomial random variables  3.3.15 determine and use the probabilities associated with the binomial  distribution with parameters and ; note the mean and variance of a binomial distribution  3.3.16 use binomial distributions and associated probabilities to solve practical problems | | 9B | 5.03  5.04  5.05  5.06 | | Test 4 |
| 4 | **Revision** | |  | | |  |
| 5 |  | |  | | | Exam |

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| Sesmeter Two | | | | | | |
| Week | Syllabus Entry – Unit 3 | | Textbook Reference | | | Assessment |
| Term 2 | | Sadler | | Nelson | |  |
| 6 | 4.1.1define logarithms as indices: is equivalent to i.e.  4.1.2establish and use the algebraic properties of logarithms  4.1.3examine the inverse relationship between logarithms and exponentials: is equivalent to  4.1.5solve equations involving indices using logarithms  4.1.7solve simple equations involving logarithmic functions algebraically | | 1A  1B  1C  1D | 7.01  7.02  7.03  7.04 | |  |
| 7 | 4.1.6identify the qualitative features of the graph of (, including asymptotes, and of its translations and  4.1.7solve simple equations involving logarithmic functions graphically  4.1.4interpret and use logarithmic scales  4.1.8identify contexts suitable for modelling by logarithmic functions and use them to solve practical problems. | | 1D  1E  1F | 7.05  7.06 | |  |
| 8 | **Calculus of the natural logarithmic function**   * + 1. define the natural logarithm     2. examine and use the inverse relationship of the functions and   4.1.11establish and use the formula  4.1.12establish and use the formula , for  4.1.13determine derivatives of the form and integrals of the form , for  4.1.14use logarithmic functions and their derivatives to solve practical problems | | 2A  2B | | 7.07  7.08  7.09 |  |
| 9 |  | |  | |  | Test 4  Investigation 2 |
| **Term 3** | | |  | |  |  |
| 1 | 4.2.1use relative frequencies and histograms obtained from data to estimate probabilities associated with a continuous random variable | | 3A | | 8.01 |  |
| 2 | 4.2.2examine the concepts of a probability density function, cumulative distribution function, and probabilities associated with a continuous random variable given by integrals; examine simple types of continuous random variables and use them in appropriate contexts  4.2.3identify the expected value, variance and standard deviation of a continuous random variable and evaluate them using technology | | 3B  3C | | 8.02  8.03  8.04  8.05 |  |
| 3 | 4.2.4examine the effects of linear changes of scale and origin on the mean and the standard deviation  4.2.5identify contexts, such as naturally occurring variation, that are suitable for modelling by normal random variables | | 3D  4A | | 8.06  8.07 |  |
| 4 | 4.2.6identify features of the graph of the probability density function of the normal distribution with mean μ and standard deviation σ and the use of the standard normal distribution  4.2.7calculate probabilities and quantiles associated with a given normal distribution using technology, and use these to solve practical problems | | 4B  4C  4D | | Chapter8 |  |
| 5 | 4.3.1examine the concept of a random sample  4.3.2discuss sources of bias in samples, and procedures to ensure randomness | | 5A | | 9.01 | Test 5 |
|  | 4.3.3use graphical displays of simulated data to investigate the variability of random samples from various types of distributions, including uniform, normal and Bernoulli | | Chapter 5 | | Chapter 9 | Investigation 3 |
| 7 | 4.3.4examine the concept of the sample proportion as a random variable whose value varies between samples, and the formulas for the mean and standard deviation of the sample proportion   * + 1. examine the approximate normality of the distribution of for large samples   4.3.6simulate repeated random sampling, for a variety of values of and a range of sample sizes, to illustrate the distribution of and the approximate standard normality of where the closeness of the approximation depends on both and | | 6A | | Chapter 9 |  |
| 8 | 4.3.7examine the concept of an interval estimate for a parameter associated with a random variable | | 6A  6B | | 10.1 |  |
| 9 | 4.3.8use the approximate confidence interval as an interval estimate for , where is the appropriate quantile for the standard normal distribution  4.3.9define the approximate margin of error and understand the trade-off between margin of error and level of confidence  4.3.10use simulation to illustrate variations in confidence intervals between samples and to show that most, but not all, confidence intervals contain | | 6B | | Chapter 10 | Test 6 |
| 10 | Revision | |  | |  |  |
| Oct Hols | Exams | |  | |  | Exam |