New Century Mathematics M1A (Oxford) **Chapter 0 Bridge Chapter**

9/9/2011 – 28/6/2012 **Teacher: Ma Siu Ling**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
0.1 **Rational Indices**	1	• Recognize the meaning of rational indices and the laws of rational indices.	• Introduce to students the meaning of rational indices and the laws of rational indices and illustrate these laws with examples.	Examples 1-3	P. 4	Ex. I		Supplementary Examples
0.2 **Factorials and C_r^n Notation**	1	• Recognize the meanings of n ! and C_r^n .	• Introduce the definition of factorial and remind students that n ! is defined only when n is a non-negative integer. • Introduce the formula of C_r^n and list out some special values of C_r^n .	Examples 4, 5 Example 6	 P. 9	Ex. II	Class Activity (P. 7)	Supplementary Examples Section Quiz
0.3 **∑ Notation**	2	• Learn the use of the ∑ notation.	• Introduce to students the concept of 'series' and its ∑ notation and give a host of examples to strengthen students' understanding about the ∑ notation. • Introduce and prove the properties of ∑.	Examples 7-10	P. 15	Ex. III		Supplementary Examples Section Quiz

20/9 –20/10 **Chapter 1 Basic Knowledge**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
1.0 **Review**	0.5	• Revise the equations of straight lines.	• Revise the related knowledge about the slope-intercept form of equations of straight lines.				Skills Assessment (P. 22)	

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
1.1 Binomial Expansion A. Terms in the Expansion of $(a+b)^n$	0.5	• Recognize the terms in the expansion of $(a+b)^n$.	• Introduce 'binomial' and 'binomial expansion'.	Example 1		Ex.1A	Class Activity (P. 23)	Lesson Worksheets
B. Coefficients in the Expansion of $(a+b)^n$	0.5	• Recognize and know how to use the Pascal's triangle.	• List out the coefficients of the terms in the expansion of $(a+b)^n$ for some special values of n to introduce the 'Pascal's triangle' and guide students to discover its properties. • Explore and investigate the relationships between the sum S of the numbers in different rows and the corresponding value of n in Pascal's triangle.				Inquiry & Investigation (P. 24)	Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Teaching Suggestions: Example	Teaching Suggestions: Class Practice	Teaching Suggestions: Exercise	Teaching Suggestions: Remarks	Linked Resources
C. Binomial Theorem	1.5	• Recognize and know how to apply the binomial theorem.	• Use method of combination to deduce the binomial theorem and introduce its representation in $\sum$ notation. • Point out a special case, i.e. when $a = 1$ and $b = x$, $(1+x)^n = \sum_{r=0}^{n} C_r^n x^r$.	Examples 2-6	P. 28	Ex.1A		Supplementary Examples Section Quiz
1.2 Exponential Functions A. Fundamental Concept	0.5	• Recognize the concept of exponential functions.	• Through Class Activity, introduce the definition of exponential functions and emphasize the general form $y = a^x$ where a is a constant which is greater than zero and not equal to 1. • Let students discuss and explore the reasons why the value of a in exponential function $y = a^x$ should not be equal to 1. • Remind students to note that, for an exponential function $y = a^x$, the value of x can be any real number but that of y must be positive.				Class Activity (P. 30) Class Activity (P. 31)	
B. A Special Exponential Function $y = e^x$	1	• Recognize the definition of e and exponential series.	• Introduce the special constant e (also called Euler’s number) and the definition of exponential series and					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Teaching Suggestions: Example	Teaching Suggestions: Class Practice	Teaching Suggestions: Exercise	Teaching Suggestions: Remarks	Linked Resources
			state that the value of e can be found by using the exponential series.					
			• Through Class Activities, obtain the conclusion that the values of e^x and $\sum_{r=0}^{10}\frac{x^r}{r!}$ are very close so as to state the fact $e^x=\sum_{r=0}^{\infty}\frac{x^r}{r!}$.				Class Activity (P. 32)	
			• Through examples, illustrate to students the application of exponential series.	Examples 7, 8		Ex.1B		Supplementary Examples
C. Graphs of Exponential Functions	0.5	• Recognize the graphs of exponential functions and understand the relationship between the graphs of $y=a^x$ and $y=\left(\frac{1}{a}\right)^x$.	• Through the graphs, discuss the features of the graphs of the exponential function $y=a^x$ and hence further discuss the graph of $y=e^{kx}$ which is another way to express an exponential function.			Ex.1B		Section Quiz
			• Prove that the graphs of $y=a^x$ and $y=\left(\frac{1}{a}\right)^x$ are symmetrical about the y-axis and illustrate this fact with a diagram.		P. 36			

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Teaching Suggestions: Example	Teaching Suggestions: Class Practice	Teaching Suggestions: Exercise	Teaching Suggestions: Remarks	Linked Resources
1.3 Logarithmic Functions								
A. Fundamental Concept	1	• Recognize and apply the fundamental concept of logarithms.	• Introduce the definition of logarithms and obtain several fundamental equalities from the definition of logarithms.					
			• Demonstrate to use the fundamental concept of logarithms to find the values of logarithms or numerical expressions with examples.	Example 9		Ex.1C		Supplementary Example
			• Introduce the common logarithms and natural logarithms and their notations. Illustrate that the common logarithm and natural logarithm of a number can be found by using a calculator with examples.					
			• Obtain the two fundamental equalities of natural logarithms from the definition of logarithms and demonstrate their applications with examples.	Example 10				Supplementary Example
B. Properties of Logarithms	0.5	• Explore and apply the properties of logarithms.	• Through Class Activity, lead students to discover several properties of logarithms.				Class Activity (P. 41)	
			• Through examples, guide students the methods and skills for using the properties of logarithms to find the values of numerical expressions or simplify expressions involving logarithms.	Examples 11, 12		Ex.1C		Supplementary Examples
C. Change of Base	0.5	• Recognize and apply the change-of-base formula.	• Deduce the change-of-base formula and state that a common logarithm can be converted into a natural logarithm					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
			and vice versa using this formula.					
			• Demonstrate the application of the change-of-base formula with examples.	Examples 13, 14		Ex.1C		Supplementary Examples
D. Graphs of Logarithmic Functions	0.5	• Recognize the graphs of logarithmic functions and understand the relationship between the graphs of $y=\log_a x$ and $y=\log_{\frac{1}{a}} x$.	• Introduce the definition of logarithmic function.					
			• Through the graphs, discuss the features of the graph of logarithmic function $y=\log_a x$. Display the graphs of common logarithm $y=\log x$ and natural logarithm $y=\ln x$.			Ex.1C		Section Quiz
			• Prove that the graphs of $y=\log_a x$ and $y=\log_{\frac{1}{a}} x$ are symmetrical about the x-axis and illustrate this fact with a diagram.					
			• Prove that the graphs of $y=\log_a x$ and $y=a^x$ are symmetrical about the straight line $y=x$ and illustrate this fact with a diagram.		P. 47			

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
1.4 Applications of Exponential and Logarithmic Functions								
A. Compound Interest	0.5	• Know how to apply exponential or logarithmic functions to solve problems involving compound interest.	• Introduce the formula for calculating amount accumulated after n years in the situation when the interest is compounded and state that the formula can be expressed using exponential functions.					
			• Through examples, guide students to apply exponential or logarithmic functions to solve problems involving compound interest.	Examples 15, 16		Ex.1D		Supplementary Examples
B. Population Growth	0.5	• Know how to apply exponential or logarithmic functions to solve problems involving population growth.	• Introduce the formula for finding the population after n years when the population grows steadily at a fixed percentage and state that the formula can be expressed using exponential functions.					
			• Through examples, guide students to use exponential and logarithmic functions to solve problems involving population growth.	Examples 17, 18		Ex.1D		Supplementary Examples
C. Depreciation	0.5	• Know how to apply exponential or logarithmic functions to solve problems involving depreciation.	• Introduce the formula for calculating the value of a good after n years when the value of the good decreases at a fixed percentage annually and state that the depreciation problem can be transformed into a problem involving exponential and logarithmic functions.					
			• Through examples, provide students with a reference for solving problems involving depreciation.	Example 19		Ex.1D		Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
D. Radioactive Decay	0.5	• Know how to apply exponential or logarithmic functions to solve problems involving radioactive decay.	• Introduce the formula for calculating the weight of a piece of radioactive substance after t years of breaking down and emitting radiation and provides students with a reference for solving the problems of the same kind through examples.	Examples 20, 21	P. 55	Ex.1D		Supplementary Examples Section Quiz
1.5 Transformation of Non-linear Relations to Linear Relations A. Relation of the Form $y = kx^n$	1	• Learn to put $y = kx^n$ into the form of a linear relation.	• Through Class Activity, let students understand that it is not easy to estimate other values accurately using the graph of $y = kx^n$. Then explain the method of converting $y = kx^n$ into the form of a linear relation.				Class Activity (P. 58)	
			• Through examples, guide students to sketch the linear graph of $y = kx^n$ and find the relationship between the two variables.	Example 22		Ex.1E		Supplementary Example
B. Relation of the Form $y = ka^x$	0.5	• Learn to put $y = ka^x$ into the form of a linear relation.	• Introduce the method of converting $y = ka^x$ into the form of a linear relation.					
			• Through examples, guide students to sketch the linear graph of $y = ka^x$ and find the relationship between the two variables.	Example 23	P. 63	Ex.1E		Supplementary Example Section Quiz

21/10 – 15/11 **Chapter 2 Derivatives of Functions**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
2.0 **Review**	0.5	• Revise functions.	• Revise the basic knowledge about a function including the definition, notation and graph.				Skills Assessment (P. 76)	
2.1 **The Intuitive Concept of Limit**	1	• Recognize the intuitive concept of the limit of a function.	• Bring out the intuitive concept of limit through an example and introduce its representation in symbol. • Taking the function $f(x)=\frac{x^2-4}{x-2}$ as an example, explore the continuity of its graph. • Through examples, consolidate students' understanding about the limits of functions. • Discuss the graph of the function $y = f(x)$ and guide students to recognize that if the graph of a function $y = f(x)$ is continuous at $x = a$, then $\lim_{x\to a} f(x) = f(a)$. • Illustrate with examples that some common functions such as constant functions, polynomial functions and exponential functions are continuous at every real value and other functions (such as power functions and logarithmic functions) are continuous at every positive value.	Example 1	P. 80	Ex.2A		Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
2.2 Theorems on Limits	1	• Recognize the theorems on limits.	• Through Class Activity, lead students to discover the limit of the sum of two functions and hence bring out the theorems on limits of the sum, difference, product and quotient of two functions and consolidate students' understanding about theorems on limits.	Example 2		Ex.2A	Class Activity (P. 81)	Supplementary Example Section Quiz
		• Learn to find the limit of rational functions and composite functions.	• Through examples, guide students to find the limit of rational functions.	Example 3				Supplementary Example
			• Introduce the concept of composite functions and the theorems applicable to handling the limits of composite functions and illustrate with examples.					
			• Through examples, guide students to apply the theorems to find the limits of composite functions.	Example 4	P. 84			Supplementary Example
2.3 Limits at Infinity	1	• Recognize the intuitive concept of the limits at infinity of a function.	• Taking the function $f(x)=\frac{1}{x}$ as an example, bring out the intuitive concept of limits at infinity of a function and further elaborate the concept with the exponential function $f(x)=e^{kx}$ and its graph. • Ask students to bear in mind the following conclusions:					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
		• Learn to find the limits at infinity of rational functions and exponential functions.	$\lim_{x\to\infty}\frac{1}{x}=0$, $\lim_{x\to-\infty}\frac{1}{x}=0$, $\lim_{x\to-\infty}e^{kx}=0\ (k>0)$, $\lim_{x\to\infty}e^{kx}=0\ (k<0)$. • Through examples, guide students to use these theorems and some conclusions to evaluate the limits at infinity of rational functions and exponential functions.	Examples 5, 6	P. 91	Ex.2B		Supplementary Examples Section Quiz
2.4 Derivatives A. The Concept of Derivative	1	• Recognize the concept of derivative of a function from first principles.	• Through Class Activity, bring out the concept of derivative of a function and its notation from the ratio of increment of function to increment of independent variable. • Introduce the concept and notation of derived function and state the difference and relation between the derivative and the derived function of a function. • State the meanings of differentiation and differentiability.			Ex.2C	Class Activity (P. 93)	
B. Geometric Interpretation of the Derivative	0.5	• Recognize the slope of tangent to the curve $y=f(x)$ at $x=x_0$.	• Through an example, with accordance to the definition of derivative, bring out the slope of the tangent to a curve $y=f(x)$ at a point $x=x_0$ is $f'(x_0)$.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
C. Differentiation of Constant Functions and Power Functions	1	• Learn to find the derivatives of constant functions and power functions.	• Deduce the differentiation formula of constant functions, i.e. the Constant Rule: for any constant C, $\frac{d}{dx}(C)=0$. • Deduce the differentiation formula of power functions, i.e. the Power Rule: $\frac{d}{dx}(x^n)=nx^{n-1}$ where n is a positive integer. • Through examples, guide students to use the formulae to find the derivatives of power functions and the slopes of tangents.	Examples 7, 8	P. 98	Ex.2C		Supplementary Examples Section Quiz

16/11 – 9/1 **Chapter 3 Differentiation of a Function and Second Derivative**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
3.1 Rules of Differentiation A. Differentiation of the Sum of Functions	1.5	• Understand and apply the sum rule of differentiation to find the derivatives of functions.	• Introduce the sum rule of differentiation, i.e. the derivative of the sum of two functions is the sum of their derivatives, and prove this rule using the definition of derivative. • Through examples, guide students to use the sum rule to find the derivatives of functions.	Examples 1, 2		Ex.3A		Supplementary Examples

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
		• Understand the difference rule of differentiation and apply the sum and difference rules to find the derivatives of functions.	• State that the difference rule of differentiation is similar to the sum rule and introduce the difference rule.					
			• Through examples, guide students the skills of using the sum rule and difference rule at the same time to find the derivatives of functions.	Examples 3, 4	P. 111			Supplementary Examples
B. Differentiation of the Product of Two Functions	1	• Understand the differentiation of the product of two functions.	• Deduce the product rule according to the definition of derivative and the theorems on limits and consolidate students' understandings and uses of the product rule through examples.	Example 5		Ex.3A		Supplementary Example
			• Deduce the constant multiple rule. State that this rule can be applied to find the derivative of polynomials with coefficients other than 1 or -1.					
		• Apply the sum, difference and product rules to find the derivatives of functions.	• Through examples, guide students to use the sum, difference and product rules wisely to find the derivatives of functions.	Example 6				Supplementary Example
C. Differentiation of the Quotient of Two Functions	1	• Understand the differentiation of the quotient of two functions.	• Deduce the quotient rule of differentiation using the definition of derivative.					
		• Use the product and quotient rules wisely to find the derivatives of functions.	• Through examples, guide students the skills of using the product and quotient rules to find derivatives of functions.	Examples 7, 8	P. 116	Ex.3A		Supplementary Examples Section Quiz
D. Differentiation of Composite Functions	1	• Learn to apply chain rule to find the derivatives of composite functions.	• Explain the concept of composite function with an example and point out that the chain rule can be applied to find the derivative of a composite					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
			function if it can be written as the composition of two simpler functions. • Introduce the chain rule and explain this rule with examples. • Through examples, guide students to use the chain rule to find the derivatives of composite functions.	 Examples 9, 10		 Ex.3B		 Supplementary Examples
E. Differentiation of the Inverse Function of a Function	1	• Recognize the concept of inverse functions and make use of the relationship between a function and its inverse function to find the derivatives of inverse functions.	• Explain the concept of inverse function with an example and deduce the differentiation of inverse function from the chain rule. • Through examples, guide students the methods and skills for finding the derivatives of inverse functions.	 Examples 11-13	 P. 122	 Ex.3B		 Supplementary Examples Section Quiz
3.2 **The Derivatives of Power Functions, Exponential Functions and Logarithmic Functions** A. The Derivatives of Power Functions	1	• Learn the rule of differentiating power functions.	• Prove the rule of differentiating power functions, i.e. for any rational number n, $\frac{d}{dx}(x^n) = nx^{n-1}$. • Through examples, guide students the methods and skills for finding the derivatives of algebraic functions.	 Examples 14, 15		 Ex.3C		 Supplementary Examples
B. The Derivatives of Exponential Functions	1.5	• Learn the rules of differentiating exponential functions.	• Obtain the derivative of e^x, i.e. e^x itself, from derivative of an infinite series. • Through examples, guide students the	 Examples		 Ex.3C		 Supplementary

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
			methods and skills for finding the derivatives of exponential functions and obtain the rule: $\frac{d}{dx}(e^{kx}) = ke^{kx}$ (k is a constant).	16-18				Examples
			• Obtain the derivative of the exponential function $y = a^x$ by first changing its base to e and hence deduce the formula for differentiating general exponential functions and consolidate students' understanding and uses of this formula for differentiation through examples.	Example 19				Supplementary Example
C. The Derivatives of Logarithmic Functions	3	• Learn the rules of differentiating logarithmic functions.	• Deduce the formula for differentiating logarithmic functions with base e.					
			• Explore and investigate the relationship between slope of tangents of $y = \ln x$ and the derivative of $y = \ln x$.				Inquiry & Investigation (P. 131)	Lesson Worksheets
			• Through finding the derivative of a^y with respect to y, deduce the formula for finding the derivative of general logarithmic function $y = \log_a x$ with base a.					
			• Explore the method for finding the derivative of the function $y = \log_a x$ through converting $\log_a x$ to natural logarithm.				Inquiry & Investigation (P. 132)	Lesson Worksheets
			• Through examples, guide students the methods and skills for finding the	Examples 20-22		Ex.3C		Supplementary Examples Section Quiz

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
			derivatives of logarithmic functions. • Point out that logarithmic differentiation can be used to find the derivatives of functions involving variable exponent or complicated products or quotients and guide students to learn to use logarithmic differentiation to find the derivatives of functions through examples.	Example 23	P. 135			Supplementary Example
3.3 The Second Derivative of a Function	2	• Recognize the concept of second derivative of a function and learn to find the second derivatives of functions.	• Introduce and explain to students the concept and notation of second derivative with examples. • Through examples, teach students the methods and skills for finding the second derivative. • Through examples, provide a reference for proving equations involving first or second derivatives.	Examples 24, 25 Example 26	P. 141	Ex.3D		Supplementary Examples Section Quiz Supplementary Example
First Term Exam 6/1 – 18/1		**Chapter 1-4**						

19/1 – 2/3 **Chapter 4 Applications of Differentiation**

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
4.1 Tangents to a Curve	1.5	• Learn to find the equations of tangents to a curve.	• State that differentiation can be used to find the equation of tangent to a					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Teaching Suggestions: Example	Teaching Suggestions: Class Practice	Teaching Suggestions: Exercise	Teaching Suggestions: Remarks	Linked Resources
			curve $y = f(x)$ in a rectangular coordinate plane and lead students to recall that the slope of tangent to $y = f(x)$ at $P(x_0, y_0)$ is $f'(x_0)$ and hence the equation of tangent to $y = f(x)$ at $P(x_0, y_0)$ can be deduced from the point-slope form of the equation of straight line. • Through examples, guide students to find the equation of tangent to a curve under different given conditions and train students the skills of applying their knowledge wisely at the same time.	Examples 1-5	P. 157	Ex.4A		Supplementary Examples Section Quiz
4.2 Maxima and Minima A. The Concept of Maximum and Minimum	0.5	• Understand the concept of relative maximum and minimum of a function.	• Taking the graph of a function as an example, introduce to students the concepts of maximum point, relative maximum, minimum point and relative minimum.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			• After students have understood these concepts, give the definitions of relative maximum and minimum of the function $y = f(x)$ and state that the relative maximum and minimum of $f(x)$ can be collectively known as local extrema.					
B. Test for Maximum and Minimum Points—First Derivative Test	1.5	• Learn to use the first derivative test to test for relative maximum and relative minimum and the types of stationary points.	• With the diagram, discuss how to test for the maximum and minimum points of the function $f(x)$ from the signs of slopes of tangents and hence find the relative maxima and relative minima.					
			• Based on the above discussion, summarize the steps of finding the relative maxima and relative minima of a given function $f(x)$ and introduce emphatically the first derivative test and demonstrate it with a quick example.	Quick Example (P. 161)		Ex.4B		Section Quiz
			• With a diagram, explain to students the meanings of stationary point, turning point and point of inflexion.					
			• Through examples, further consolidate students' mastering of the method and steps of finding relative maxima and relative minima.	Example 6				Supplementary Example
			• Teach students to use the first derivative test to test for the types of stationary points through examples.	Examples 7, 8	P. 166			Supplementary Examples

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
C. Second Derivative Test	1	• Learn to use the second derivative test to test for relative maximum and relative minimum and the types of stationary points.	• Through analyzing and comparing the graphs of $y = f(x)$, $y = f'(x)$ and $y = f''(x)$, summarize and conclude the second derivative test from the above discussion and point out that the second derivative test is more efficient than the first derivative test when $f''(x)$ can be found easily.					
			• Through examples, demonstrate to students how to use the second derivative test to test for the types of stationary points.	Quick Example (P. 169) Example 9		Ex.4C		Supplementary Example
			• Point out the defect of using the second derivative test, i.e. it is inapplicable when $f''(x) = 0$ and here the first and second derivative tests may have to be used together to achieve the best result and illustrate these with examples.	Example 10				Supplementary Example
D. Global Extrema	1	• Understand the concept of global maximum and minimum of functions and learn to find the global maximum and minimum of a function.	• Explain the definitions of global maximum and global minimum and state that the global maximum and global minimum of the function $f(x)$ can be collectively known as global extrema.					
			• With the diagram, obtain the conclusion from discussion: the global extrema of $f(x)$ for $a \le x \le b$ can be found by comparing all the relative extrema of $f(x)$ for $a \le x \le b$ and the values of $f(x)$ at the end-points a and b.					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
E. Application Problems Involving Maxima and Minima	1.5	• Learn to solve the application problems involving maxima and minima.	• Through examples, guide students to find the global maximum and global minimum of a function on a closed interval.	Examples 11, 12	P. 175	Ex.4C		Supplementary Examples Section Quiz
			• Point out to students the concepts of maxima and minima often applies in daily life.					
			• Through a host of daily-life examples, state the applications of the concept of extrema in daily-life and provide references for solving this kind of problems.	Examples 13-16	P. 181	Ex.4D		Supplementary Examples Section Quiz
4.3 Rates of Change A. Velocity and Acceleration	1.5	• Understand the definition of rate of change.	• Introduce the definitions of 'average rate of change' and 'rate of change'.					
			• With a diagram, explain the meaning of 'displacement'.					
			• State that the rate of change of displacement is known as 'velocity' and the rate of change of velocity is known as 'acceleration', i.e. $v=\frac{ds}{dt}$ and $a=\frac{dv}{dt}=\frac{d^2s}{dt^2}$.					
			• Explain the concept and meaning of 'velocity'.					
			• Remind students about the units of displacement s, time t, velocity v and acceleration a.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
B. Other Rates of Change	0.5	• Be able to solve problems involving velocity and acceleration.	• Through examples, guide students to find the velocity and acceleration and provide references for solving problems involving velocity, acceleration and displacement.	Examples 17-19		Ex.4E		Supplementary Examples
		• Be able to solve other rate of change problems such as area, volume and so on.	• Through examples, guide students to find the rates of changes of radius, area and depth and provide references for solving this kind of problems.	Examples 20, 21	P. 190	Ex.4E		Supplementary Examples Section Quiz

3/3 – 30/3

Chapter 5 Indefinite Integrals and Their Applications

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
5.1 The Concept of Indefinite Integral	1	• To recognize the concept of indefinite integral.	• Through Class Activity, explore the inverse operation of differentiation and bring out the concept of 'primitive function' (or antiderivative).				Class Activity (P. 208)	
			• Through Class Activity, guide students to find a primitive function of a given function.	Example 1		Ex.5A		Supplementary Example Section Quiz
			• Through Class Activity, guide students to discover that a function can have infinite number of basically the same primitive functions and they only differ by a constant term. Hence bring out the definition of indefinite integral and let students find the indefinite integrals from the derivative of a function according to the definition of indefinite integral.				Class Activity (P. 209)	

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			• Introduce the notation $\int f(x)dx = F(x) + C$ in which $\int$ is called the integral sign, $f(x)$ is called the integrand and C is called the constant of integration.		P. 211			

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
5.2 Some Basic Integration Formulae A. Integration Formulae for $\int k\,dx$ and $\int x^n dx$	1.5	• Understand the integration formulae for $\int k\,dx$ and $\int x^n dx$ and learn to use these formulae to find the indefinite integrals of functions.	• Introduce the integration formula for constant functions: $\int k\,dx = kx + C$ and demonstrate to use this formula to find the indefinite integrals of constant functions.	Example 2		Ex.5B		Supplementary Example
			• Through Class Activity, explore the integration of x^n in general and guide students to deduce the formula: $\int x^n dx = \frac{x^{n+1}}{n+1} + C \ (n \neq -1)$.				Class Activity (P. 214)	
			• Through examples, guide students the methods and skills of using the integration formulae to find the indefinite integrals of powers of x and the product of two powers of x.	Examples 3, 4				Supplementary Examples
			• Explore with students to obtain the conclusion when $n = -1$, $\int x^n dx$, i.e. $\int \frac{1}{x} dx = \ln\|x\| + C$.					
B. Integration Formulae for Exponential Functions	0.5	• Understand the integration formulae for exponential functions and learn to use these formulae to find the indefinite integrals of exponential functions.	• Introduce and prove the integration formulae for exponential functions.					
			• Through examples, demonstrate how to use the integration formulae for exponential functions to find the indefinite integrals.	Example 5		Ex.5B		Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Example	Class Practice	Exercise	Remarks	Linked Resources
C. Other Useful Formulae of Integration	2	• Understand other useful formulae of integration and apply integration formulae wisely to find the indefinite integrals of different types of functions.	• Guide students to deduce and obtain the formula: $\int k\,f(x)dx = k\int f(x)dx$					
			• Through examples, guide students to use this formula to find the indefinite integrals of products of constant and function and master the skills of using the formula.	Examples 6, 7		Ex.5B		Supplementary Examples Section Quiz
			• Using the sum and difference rule of differentiation, deduce and prove the formula: $\int [f(x) \pm g(x)]dx = \int f(x)dx \pm \int g(x)dx$ and extend this to the case with more than two functions.					
			• State that the above two formulae can be combined as: $\int [k\,f(x) \pm mg(x)]dx = k\int f(x)dx \pm m\int g(x)dx$.					
			• Through examples, guide students the methods and skills of using these formulae to find the indefinite integrals of various types of functions and strengthen students' skills of applying these formulae.	Examples 8-11				Supplementary Examples
			• Remind students that there is no product and quotient rules in integration similar to those in differentiation.		P. 224			
5.3 Integration by	2	• Learn to use	• Through Class Activity, explore and explain				Class	

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
Substitution		integration by substitution to find indefinite integrals.	the integration by substitution. • Through examples, guide students to use integration by substitution to find indefinite integrals and remind students the result of integration can be checked by simply differentiating the answer obtained. • Through examples, teach students the skills of finding indefinite integrals by first transforming the integrand and then using integration by substitution.	 Examples 12-14 Examples 15, 16	 P. 233	 Ex.5C	Activity (P. 227)	 Supplementary Examples Section Quiz Supplementary Examples
5.4 Geometrical Meaning of Indefinite Integrals	1	• Recognize the geometrical meaning of indefinite integrals. • Be able to find the equation of curve under given conditions such as slope, etc.	• State the geometrical meaning of indefinite integrals is to find the equation of a curve from the given slope of tangent and illustrate the geometrical relationship between differentiation and indefinite integration with a diagram. • Give an example to illustrate that an indefinite integral can represent a family of curves and the slope functions of these curves are all equal to the integrand. If the constant of integration is to be determined, more information is required. • Through examples, guide students to find the equation of curves from given $\frac{dy}{dx}$ or $\frac{d^2y}{dx^2}$.	Examples 17-19	P. 238	Ex.5D		Supplementary Examples Section Quiz

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
5.5 Applications of Indefinite Integrals								
A. Problems Involving Rates of Change	0.5	• Be able to apply indefinite integration to solve application problems involving rates of change.	• State the applications of definite integration in various fields of study. • Through daily-life examples, illustrate how indefinite integrals are applied to solve problems related to rates of change.	Example 20		Ex.5E		Supplementary Example
B. Problems on Motion	1.5	• Be able to use indefinite integration to solve application problems involving motion.	• Let students recall the relations of velocity and acceleration and hence establish the relations: $s=\int v\,dt$ and $v=\int a\,dt$. • Through examples, guide students to use indefinite integrals to solve application problems involving motion from given velocity or acceleration and hence strengthen their problem-solving abilities.	Examples 21-23	P. 245	Ex.5E		Supplementary Examples Section Quiz

11/4 – 16/5 **Chapter 6 Definite Integrals and Their Applications**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
6.0 Review	0.5	• Revise the transformations of graphs of functions.	• Revise the effects of transformation on the graphs of functions including reflection and translation.				Skills Assessment (P. 260)	
6.1 The Concept of Definite Integration	2	• Recognize the concept of definite integration.	• With examples and diagrams, explain how areas bounded by curves can be found and hence explain the meaning of definite integration.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			• Through Class Activity, let students discover that the required area will not be affected when an arbitrary point is chosen from each sub-interval. • Deduce the definition of definite integral and introduce the notation of $\int_a^b f(x)dx$ in which $f(x)$ is known as the integrand, a and b are known as the lower and upper limits respectively. • Remind students that the definite integral of a function may not exist. Definite integrals and indefinite integrals are different in nature. A definite integral is a value while an indefinite integral is a family of functions. • Through examples, guide students to evaluate definite integrals from the definition.	Examples 1, 2		Ex.6A	Class Activity (P. 263)	Supplementary Examples
			• State the definition $\int_a^b f(x)dx = -\int_b^a f(x)dx$ when $a > b$.					
6.2 Evaluation of Definite Integrals A. The Fundamental Theorem of Calculus	1	• Understand the Fundamental Theorem of Calculus	• Introduce and prove the Fundamental Theorem of Calculus and state that there is a close relationship between indefinite integrals and definite integrals and use this theorem to evaluate definite integrals quickly.					

Section	Time Ratio	Learning Targets	Teaching Suggestions: Teaching Guide	Teaching Suggestions: Example	Teaching Suggestions: Class Practice	Teaching Suggestions: Exercise	Teaching Suggestions: Remarks	Linked Resources
			• Demonstrate to use the Fundamental Theorem of Calculus to evaluate definite integrals.	Quick Example (P. 268)		Ex.6A		
B. Definite Integration of Algebraic and Exponential Functions	2	• Learn to apply the Fundamental Theorem of Calculus to evaluate definite integrals of algebraic and exponential functions.	• Through a host of examples, demonstrate how to apply Fundamental Theorem of Calculus to evaluate definite integrals of algebraic and exponential functions and let students master the skills of finding these kinds of definite integrals.	Examples 3-7		Ex.6A		Supplementary Examples
			• Let students explore to evaluate definite integrals using the calculator and comment on the answers obtained.		P. 273		Inquiry & Investigation (P. 273)	Lesson Worksheets
C. Properties of Definite Integrals	1	• Understand the properties of definite integrals and use them to evaluate the sum and difference of definite integrals.	• Introduce and prove the properties of definite integrals and state that these properties can help evaluate definite integrals.					
			• Consolidate students' understandings about the properties of definite integral through examples and let them master the methods and skills of evaluating the sum and difference of definite integrals.	Examples 8-10	P. 276	Ex.6A		Supplementary Examples Section Quiz
6.3 Definite Integration by Substitution	2.5	• Learn to use integration by substitution to find definite integrals.	• Exhibit the two methods of evaluating a definite integral using integration by substitution with an example and compare the two methods.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			• Through a host of examples, guide students to use definite integration to find the definite integrals of various types of functions and let them master the skills of applying integration by substitution.	Examples 11-17		Ex.6B		Supplementary Examples Section Quiz
			• Through examples, guide students to use the integration by substitution and properties of definite integrals to evaluate definite integrals and strengthen their skills of integrating various methods of evaluating definite integrals.	Example 18	P. 285			Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
6.4 Applications of Definite Integrals: Finding Areas of Plane Figures A. Area between a Curve $y = f(x)$ and the x-axis	1.5	• Be able to use definite integration to find areas between a curve $y = f(x)$ and the x-axis	• Lead students recall the method of finding the area bounded by a curve, the x-axis, $x = a$ and $x = b$ when the curve $y = f(x)$ lies above the x-axis and illustrate with examples. • Discuss the case when the curve $y = f(x)$ lies below the x-axis. Using the method of reflection, obtain the area bounded by the curve $y = f(x)$, the x-axis, $x = a$ and $x = b$ in this case, i.e. $-\int_a^b f(x)dx$. • Through examples, guide students the methods of finding the areas between the various types of curves and the x-axis and train their problem-solving abilities.	Example 19 Examples 20, 21		Ex.6C		Supplementary Example Supplementary Examples
B. Area between a Curve $x = g(y)$ and the y-axis	1	• Be able to use definite integration to find area between a curve $x = g(y)$ and the y-axis.	• State that by interchanging the roles of x and y, the method of finding area between the curve $x = g(y)$ and y-axis is similar to that before the interchanging of roles.					

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			• Through examples, guide students the methods of finding the areas between the various types of curves and the y-axis and train their problem-solving abilities.	Examples 22, 23	P. 294	Ex.6C		Supplementary Examples
C. Area between Two Curves	2	• Be able to use definite integration to find area between two curves.	• Through Class Activity, guide students to use definite integrals to represent the area between two curves.				Class Activity (P. 295)	
			• With examples and diagrams, discuss the methods of finding the areas between two curves in various cases.					
			• Through examples, guide students the methods of finding the area between two curves and train their problem-solving abilities.	Examples 24-26		Ex.6C		Supplementary Examples Section Quiz
			• Through examples, let students master the methods and skills of finding the area bounded by three curves.	Example 27	P. 302			Supplementary Example
6.5 Applications of Definite Integrals: Solving Problems Related to Rates of Change	1.5	• Be able to use definite integration to solve application problems involving rates of change.	• State that the increase in quantity $Q(t)$ over an arbitrary time interval, i.e. from $t = t_1$ to $t = t_2$, $\int_{t_1}^{t_2} Q'(t)dt$, can be found using definite integration.					
			• Through examples, guide students to use definite integration to solve application problems involving rates of change and provide students with references for solving this kind of problems.	Examples 28-30	P. 311	Ex.6D		Supplementary Examples Section Quiz

17/5 – 12/6 **Chapter 7 Approximation of Definite Integrals Using the Trapezoidal Rule**

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
7.1 The Trapezoidal Rule	2	• Understand the Trapezoidal Rule and use it to find the approximate values of definite integrals.	• Point out the limit of evaluating the definite integrals using Fundamental Theorem of Calculus so as to introduce the Trapezoidal Rule.					
			• Through examples and diagrams, explain and deduce the meaning of the Trapezoidal Rule.					
			• Remind students about the applicable range of the Trapezoidal Rule and the cases of over-estimate or under-estimate when applying the Trapezoidal Rule to evaluate definite integrals.					
			• Through examples, guide students to understand how to apply the Trapezoidal Rule to find definite integrals.	Examples 1, 2		Ex.7A		Supplementary Examples Section Quiz
			• Through Class Activity, let students recognize that, in general, the larger the number of sub-intervals, the more accurate the approximate value of the definite integral obtained from the Trapezoidal Rule.				Class Activity (P. 330)	
			• Through examples, let students further master the method of applying the Trapezoidal Rule to find the approximate value of definite integrals	Example 3	P. 332			Supplementary Example

Section	Time Ratio	Learning Targets	Teaching Suggestions					Linked Resources
			Teaching Guide	Example	Class Practice	Exercise	Remarks	
			and learn to determine whether the approximate is an over-estimate or an under-estimate.					
7.2 Applications of the Trapezoidal Rule A. Geometrical Applications	1	• Be able to use the Trapezoidal Rule to solve geometrical application problems involving definite integrals.	• Point out that the Trapezoidal Rule can be applied to solve a problem when the evaluation of definite integral is involved and cannot be done easily. • Through examples, guide students to apply the Trapezoidal Rule to solve problems that involve finding the area of a certain region.	Examples 4, 5		Ex.7B		Supplementary Examples
B. Practical Applications	1	• Be able to use the Trapezoidal Rule to solve practical application problems involving definite integrals.	• Through examples, guide students to apply the Trapezoidal Rule to solve practical application problems involving the evaluation of definite integrals and hence enhance their problem-solving skills.	Examples 6, 7	P. 339	Ex.7B		Supplementary Examples Section Quiz
Second Term Exam 9/6 – 22/6		**Chapter 4-7**						