OCR A Level Mathematics – Further Pure 2 Scheme of Work

Examination in May of Year 13
Course teaching begins in June of Year 12.
The number of lessons stated is for teaching the unit. Allow more lessons for topic consolidation, assessment tests and revision informed by the test results.
The duration of the course is approximately 25 weeks, 2 lessons a week. Aim to finish teaching by May to allow for exam practice.

Year 12 – After AS Exams – 2 lessons a week

POLAR COORDINATES (7 Lessons)

Topic	Content	Text	Lessons
Polar coordinates	Introduction, definitions and conventions. The relations between Cartesian and polar coordinates.	FP2 Chapter 6.1-6.2 Ex. 6A, pg. 95	1
	Sketching simple graphs of polar equations (provide polar graph paper). The use of symmetry – identify and apply symmetry.	FP2 Chapter 6.3-6.4 Ex. 6B, pg. 97 Ex. 6C, pg. 99	1
	Identify maximum and minimum values of r, directions of the tangents to the curve at origin.	FP2 Chapter 6.5-6.6 Ex. 6D, pg. 102	2
	Equations in polar and Cartesian coordinates, convert equations in both directions.	FP2 Chapter 6.7 Ex. 6E, pg. 104	2
	Finding areas of sectors using polar coordinates (simple integrands only).	FP2 Chapter 6.8 Ex.6F, pg. 107	1

RATIONAL FUNCTIONS AND GRAPHS (introduction, 3 lessons)

Topic	Content	Text	Lessons
Introduction to rational functions	Recap of algebraic fractions from GCSE – simplifying, adding, subtracting, multiplying and dividing. Simplify rational functions Multiply and divide rational functions Add and subtract rational functions	Own resource Core 4 Solomon press worksheet A	3
Assessment – Polar coordinates I and introduction to rational functions			

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Work to be covered from September of Year 13

RATIONAL FUNCTIONS AND GRAPHS (10 lessons)

Topic	Content	Text	Lessons
The graph of $y^2=f(x)$	Understand and use the relationship between the graphs of $y=f(x)$ and $y^2=f(x)$ (symmetry, intersections, stationary points, gradient at roots of $f(x)$)	FP2 Chapter 12 Ex. 12, Misc. Ex. 12, pg. 203	2
Partial fractions	Teach partial fractions methods for linear factors, quadratic factors (in the form x^2+a^2) Revise division of polynomials and apply to improper fractions (where the degree of the numerator exceeds the degree of the denominator). Explain how the two methods are connected. Avoid questions with integration.	FP2 Chapter 2 Ex. 2A, pg. 25 Core 4 Solomon Press Worksheet B Ex. 2B, Misc. Ex. 2, pg. 32	4
Graphs of rational functions	Determine the salient features of the graph of a rational function for which the numerator and denominator are of degree at most 2, including in particular (i) asymptotic behaviour (understanding of oblique asymptotes as well as well as asymptotes parallel to the axes) (ii) any restrictions on the values taken by the function (algebraic technique as well as stationary point analysis)	FP2 Chapter 5 Ex. 5A, pg. 81 Ex. 5B, pg. 87 Ex. 5C, Misc. Ex. 5, pg. 90	4
Assessment – Rational functions and graphs			

NUMERICAL METHODS (5 lessons)

Topic	Content	Text	Lessons
Approximations and errors	Understand, in geometrical terms involving 'staircase' and 'cobweb' diagrams, the convergence (or not) of an iteration of the form $x_{n+1}=F(x_n)$ to a root of the equation $x=F(x)$. Use the fact that for an iteration in the form above which converges to α, successive (small) errors e_n are such that: (i) $e_{n+1}\approx F'(\alpha)e_n$, if $F'(\alpha)\neq 0$, (ii) e_{n+1} is approximately proportional to e_n^2 (in general) if $F'(\alpha)=0$.	FP2 Chapter 8 Ex. 8A, pg. 139 Ex. 8C, Misc. Ex. 8, pg. 148 *Ext. work: Ex. 8B, pg. 142	2
Newton-Raphson method	Understand, in geometrical terms the working of the Newton-Raphson method, and appreciate conditions under which the method may fail to converge to the desired root. Derive and use iterations based on Newton-Raphson method, and understand that it is an example of an iteration of the form $x_{n+1}=F(x_n)$ with $F'(\alpha)=0$.	FP2 Chapter 9 Ex. 9A, pg. 156 Ex. 9B, pg. 162 Ex. 9C, Misc. Ex. 9, pg. 164	3
Assessment – Numerical methods			

HYPERBOLIC FUNCTIONS (6 lessons)

Topic	Content	Text	Lessons
Hyperbolic functions	Recall definitions of the six hyperbolic functions in terms of exponentials, and sketch the graphs of simple hyperbolic functions; Derive and use identities for hyperbolic functions; Use the notations $\sinh^{-1}x$, $\cosh^{-1}x$, $\tanh^{-1}x$ to denote the principal values of the inverse hyperbolic relations, and derive and use expressions in terms of logarithms for these.	FP2 Chapter 4.1-4.2, 4.6 Ex. 4A, pg.58 Ex. 4D, pg 69 (Q1-Q4, Q8, Q12, *Q9 ext. work)	6
Assessment – Hyperbolic functions			

DIFFERENTIATION (6 lessons)

Topic	Content	Text	Lessons
Maclaurin series	Derive and use the first few terms of the Maclaurin series of simple functions, e.g. e^x, $\sin ax$, $\cos ax$, $e^x \sin x$, $\ln(ax+b)$.	FP2 Chapter 3 Ex. 3A, pg. 39 Ex. 3B, pg. 42 Ex. 3C, pg. 48	2
Inverse trigonometric functions	Derive and use derivatives of $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$.	FP2 Chapter 1 Ex. 1A, pg. 7 *Ext.work: Ex. 1C, pg 16 (except Q3)	2
Hyperbolic functions	Derive and use derivatives of $\sinh x$, $\cosh x$, $\tanh x$, $\sinh^{-1}x$, $\cosh^{-1}x$, $\tanh^{-1}x$ Introduction to other hyperbolic functions and their derivatives.	FP2 Chapter 4 Ex. 4B, pg. 60 Ex. 4C, pg. 64 Ex. 4D, pg. 69 (Q5-Q7, Q13)	2
Assessment – Differentiation			

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INTEGRATION (9 lessons)

Topic	Content	Text	Lessons
Series and integrals	Understand how the area under a curve may be approximated by areas of rectangles, and use rectangles to estimate or set bounds for the area under a curve or to derive inequalities concerning sums.	FP2 Chapter 7 Ex. 7A, pg. 124 Ex. 7B, Misc. Ex. 7, pg. 131	2
Reduction formulae	Derive and use reduction formulae for the evaluation of definite integrals in simple cases;	FP2 Chapter 11 Ex. 11A, pg. 190 Ex. 11B, Misc. Ex. 11, pg. 194	2
Integration	Integrate the expressions corresponding to derivatives of inverse trigonometric functions, inverse hyperbolic functions, using hyperbolic function substitutions and substitution tan $x/2$. Revise Hyperbolic Functions	Ex. 1B, pg. 11 Misc. Ex.1, pg. 17 Ex. 4D, pg. 69 (Q9-Q11, *Q14) Ex. 4E, Misc. Ex. 4, pg. 73	4
Polar coordinates - area	Finding areas of sectors using polar coordinates (harder integrands). Revise Polar Coordinates.	FP2 Chapter 6.8-6.10 Ex.6F, pg. 107 Misc. Ex.6, pg. 114 Ex. 6G, pg. 113 (Ext.work)	1
Assessment – Integration			

ASSESSMENTS

Students should complete an assessment test at the end of each unit of work. These assessments are completed in class. Marks for these assessments should be recorded on the sheets provided in the KS5 Assessment area as soon as they are complete.

Students must complete the student tracking record sheet following each assessment; the teacher should also have an updated copy of these in a folder for a record.

Exam past papers should be used for preparation for the examination in May.