Year 13 Further Mathematics - Pure Teacher

Topic		Ref	Ex
Complex Numbers	**Exponential Form** • Know and use the definition $e^{i\theta} = \cos\theta + i\sin\theta$ and the form $z = re^{i\theta}$ • Multiply and divide complex numbers in exponential form.	P2.9	1A 1B
	De Moivre's Theorem • Understand de Moivre's theorem. • Use de Moivre's theorem to derive trigonometric identities • Use de Moivre's theorem to find sums of series.	P2.8	1C 1D 1E
	nth roots of a complex number • Understand the nth roots of unity (solve $z^n = 1$) and their representation in an Argand diagram • Be able to find the nth roots of any complex number. • Use complex roots of unity to solve geometric problems.	P2.10 P2.11	1F 1G
Complex Numbers Assessment			
Series	**Method of Differences** • Understand and use the method of differences to sum finite series	P4.4	2A
	Maclaurin Series • Know how to express functions as an infinite series in ascending powers using Maclaurin series expansion. • Be able to find the series expansions of compound functions.	P4.5 P4.6	2B 2C 2D
Series Assessment			
Further Calculus	**Improper Integrals** • Evaluate improper integrals where either the integrand is undefined at a value in the range of integration or the range of integration extends to infinity.	P5.2	3A
	Mean Value of a function • Understand and evaluate the mean value of a function.	P5.3	3B
	Inverse Trigonometric Functions • Differentiate inverse trigonometric functions • Integrate rational functions and be able to choose trigonometric substitutions to integrate associated functions.	P5.5 P5.6	3C 3D
	Partial Fractions • Extend integration using partial fractions to quadratics factors of the form $ax^2 + c$ in the denominator.	P5.4	3E
Further Calculus Assessment			

Year 13 Further Mathematics - Pure Teacher

Topic		Ref	Ex
Further Volumes of Revolution	**Volumes of Revolution** • Find volumes of revolution around the x-axis or y-axis for more complex functions. • Find volumes of revolution around the x-axis or y-axis for curves defined parametrically.	P5.1	4A 4B 4C
	Modelling with Volumes of Revolution • Using volumes of revolution to model real life situations.	P5.1	4D
Volumes of Revolution Assessment			
Polar Coordinates	**Definition and Cartesian conversion** • Understand and use polar coordinates (r, Θ) • Convert from polar to Cartesian coordinates and vice-versa. • Convert equations between polar and Cartesian form.	P7.1	5A
	Sketching curves • Be able to sketch curves with simple polar equations, including trigonometric functions.	P2.1	5B
	Area enclosed by a polar curve • Find the area enclosed by a polar curve. • Find the area of a region enclosed between two polar curves.	P7.3	5C
	Tangents to polar curves • Find equations of tangents parallel to or at right angles to the initial line.	P7.3	5D
Polar Coordinates Assessment			
Hyperbolic Functions	**Definition and Graphs – sinh, cosh, tanh** • Understand the definitions of hyperbolic functions: sinh x, cosh x and tanh x. • Be able to sketch their graphs and know their domains and ranges.	P8.1	6A
	Inverse hyperbolic functions – arsinh, arcosh, artanh • Understand and be able to use the definitions of the inverse hyperbolic functions and their domains and ranges. • Derive and use the logarithmic forms of the inverse hyperbolic functions.	P8.3 P8.4	6B
	Identities and Equations • Prove identities and solve equations using hyperbolic functions.	P8.1 P8.3	6C
	Calculus with hyperbolic functions • Be able to differentiated and integrate hyperbolic functions. • Use standard results for differentiating inverse hyperbolic functions to integrate functions of that type. • Choose and use a suitable hyperbolic substitution to integrate certain functions.	P8.2 P8.5	6D 6E
Hyperbolic Functions Assessment			

Year 13 Further Mathematics - Pure Teacher

Topic		Ref	Ex
Differential Equations	**Integrating Factor** • Solve first order differential equations using an integrating factor. • Find both general and particular solutions using given boundary conditions.	P9.1 P9.2	7A
	Second order differential equations • Solve second order homogeneous DEs (RHS = 0) by using the Auxiliary Equation. • Understand what to do in the case of distinct, repeated and complex roots of the auxiliary equation. • Solve second order non-homogeneous DEs (RHS = f(x)) by finding the complementary function and particular integral.	P9.4 P9.5 P9.6	7B 7C 7D
	Modelling with differential equations • Model real life situations with first order DEs. • Use DEs to model simple harmonic motion and relate the solution to the model. • Models damped and forced oscillations using DEs and interpret their solutions. • Model real-life situations using coupled first order DEs and be able to solve them.	P9.3 P9.7 P9.8 P9.9	8A 8B 8C 8D
Differential Equations Assessment			