Curriculum

Class : Sec3LS

Cycle: Secondary

Subject : Math

Textbook: Puissance

Units	Objectives	Learning Outcomes
Complex Numbers (15hrs)	- Modulus and argument of a complex number - Properties of modulus and argument - Trigonometric form - Exponential form - De Moivre's formula - Geometric interpretation for addition, multiplication of complex numbers and conjugate	- Calculate the modulus and the argument of a complex number in algebraic form - Interpret geometrically the modulus and argument of a complex number - Understand that the modulus represents the distance OA where A is the image of the complex number of affix z and argument represents angle (u,OA) . - Use properties of modulus $\lvert z\rvert\geq0,\ \lvert z\rvert=\lvert -z\rvert=\lvert \bar{z}\rvert;\ \lvert z\rvert^{2}=z.\bar{z};$ $\lvert z.z'\rvert=\lvert z\rvert.\lvert z'\rvert;\ \lvert z^{n}\rvert=\lvert z\rvert^{n};\left\lvert\dfrac{z}{z'}\right\rvert=\dfrac{\lvert z\rvert}{\lvert z'\rvert};$ $\lvert z+z'\rvert\leq\lvert z\rvert+\lvert z'\rvert$ - Use properties of argument $\arg(\bar{z})=-\arg(z)\ [2\pi]$ $\mathrm{Arg}(-z)=\pi+\arg(z0\ [2\pi]$ $\mathrm{Arg}(z,z')=\arg(z)+\arg(z')\ [2\pi]$ $\mathrm{Arg}(z^{n})=n\arg(z)\ [2\pi]$ $\mathrm{Arg}(\dfrac{z}{z'})=\arg(z)-\arg(z')\ [2\pi]$ $\mathrm{Arg}(real)=0\ [\pi]$ $\mathrm{Arg}(imaginary)=\dfrac{\pi}{2}\ [\pi]$ - Change a complex no from algebraic form to trigonometric $z=r(\cos\theta+i\sin\theta)$ - Change from trigonometric form to algebraic form. - Use notation $e^{i\theta}=\cos\theta+i\sin\theta$ - Change from trigo to exponent.

		• Change from exponential to trigonometric form. • Using uniqueness of trigonometric notation : 1) simplify complex expressions 2) solve equations in C 3) determine the nth roots of complex numbers 4) determine the trigonometric forms $\dfrac{\pi}{5}$, $\dfrac{\pi}{10}$ -….. • Use De Moivre's formula: $[r(\cos\theta+i\sin\theta)]^{n}=$ • Construct the point of affix $\bar{z}$ given the point of affix z. • Construct the point of affix $-z$ given the point of affix z. • Locate vector of affix z+z' • Locate the vector AB of affix Z_B- Z_A
Calculus (15h) Vector and mixed product	• Determine the components of the vector product of 2 non zero vectors • Determine the mixed product of 3 non zero vectors	• Determine the analytic expression of the vector product. • Use vector product to calculate area of parm and triangle • Know that vector product is zero if the 2 vectors are collinear. • Use mixed product to calculate volume of tetrahedron & parallepiped. • Know that mixed product of 3 vectors is zero if vectors are coplanar.
Equations of lines and planes in space	• Determine the Cartesian equation of a plane using form ux+vy+wz+r=0 where V(u,v,w) is normal or using mixed product. • Determine the parametric equation of a line. • Determine the Cartesian equation of a line.	• Determine the equation of a plane containing a fixed point and perpendicular to a given non-zero vector. • Determine the equation of a plane containing 3 non collinear points. • Determine the equation of a plane containing a fixed point and parallel to two lines. • Determine the equation of a plane containing a fixed point and parallel to a plane.

		• Determine the parametric equation of a line of director vector V(a,b,c) and passing through a fixed point A(x_0,y_0,z_0) $$\begin{cases} x = at + x_0 \\ y = bt + y_0 \\ z = ct + z_0 \end{cases}$$ where t is a real parameter • Determine the parametric eq of a line passing through 2 fixed points. • Determine the eq of a line passing through a point and parallel to a line. • Cartesian equation $$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$
Orthogonality between lines and planes in space	Characterize using analytical expression of vectors the orthogonality between two staright lines, straight line and plane, and two planes,	• Two straight lines of director vectors V(a,b,c) and V'(a',b',c') are orthogonal if aa'+bb'+cc'=0 • Line of director vector V is orthogonal to a plane of normal vector V' if V and V' are collinear. • Two planes of normal vectors V(u,v,w) and V'(u',v',w') are perpendicular if uu'+vv'+ww'=0
Relative position of 2 lines, 2planes or a line and a plane.	• 2 lines of director vectors V and V' are parallel (confounded) if V and V' are collinear. • 2 lines of director vectors V and V' are orthogonal if V and V' are orthogonal. • Know that 2 planes of normal vectors V and V' are parallel if V and V' are collinear.	• Determine the parametric equation of line of intersection of 2 intersecting planes. • Determine point of intersection of 2 lines. • Determine the point of intersection of a line and plane.

Distance from a point to a plane or from a point to a line	• Know and use the relation of distance from a point to a plane d= $\dfrac{\left\|ux_0 + vy_0 + wz_0 + r\right\|}{\sqrt{u^2 + v^2 + w^2}}$ • Calculate the distance from a point to a line using various methods,	• Determine the equations of the bisector planes. • Calculate the height of a tetrahedron. • Calculate the distance between 2 parallel planes. • Calculate the length of the common perpendicular between 2 noncoplanar lines.
Numerical functions (65h) Inverse functions	• Composite function of 2 given functions • Characterize the inverse function of a specific function,	• Determine the composite functions of 2 given functions. • Conditions for existence of inverse function. • Domain of definition of inverse function. • Sense of variation of inverse function. • Determine the explicit form of inverse functions. • Construct the graph of the inverse function by symmetry with respect to the first bisector.
Napierian logarithm	• Definition • Rules of calculation • Derivative and Integral • Limits • Study of function ln	• Consequences of definition • Specify domain of definition • Logarithm of product, quotient and power. • Solving equalities, inequalities and system of equations. • Calculate derivative of logarithmic functions. • Calculate integrals using change of variable, integration by parts. • Memorize basic limits and solve others by substitution, hospitals rule or common factor or denominator. • Study the sense of variation; draw the curve of logarithmic functions.
Exponentials	• Definition • Rules of calculation • Derivative and integral • Limits • Study of the function	• Consequences of definition • Exponential of product, quotient and power. • Solving equalities, inequalities and system of equations.

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		• Calculate derivative of exponential functions. • Calculate integrals using change of variable, integration by parts. • Memorize basic limits and solve others by substitution, hospitals rule or common factor or denominator. • Study the sense of variation; draw the curve of exponential functions.
Continuity and Derivation (10h)	• Image of an interval by a continuous function. • Unique Root of a continuous function over[a,b] • Rules of derivative • Use of second derivative. • Hopital's Rule	• The image of an interval by a continuous function is na interval of the same nature. • A function admits a unique root over [a,b] if f(x) is contiuous and monotonous over[a,b] and f(a)..f(b)<0 • Know that if a function f is continous and monoyonous over an interval I then f is a bijection over f(I). • Know and calculate the derivative of composite functions. • Use formula $(f^{-1})'(y_o)= \dfrac{1}{f'(x_o)}$ to calculate the derivative of inverse function. • Use second derivative to determine inflection point and maintain the relation between sign of second derivative and representative curve. • Use Hopital's Rule to calculate the limits of undetermined form $\dfrac{0}{0}, \dfrac{\infty}{\infty}$.
Integration (15h)	• Define a definite integral of a continuous function over [a,b] • Properties • Use different methods to calculate integrals	• $\displaystyle\int_a^b f(x)dx$ =F(b)-F(a) where F(x) is primitive of f(x). • Know the fundamental theorem of integration. • Use the properties (P1) to (P7)

	• Use integrals to calculate the area and volume	• (P1) $\int_a^a f(t)dt = 0$ $\int_b^a f(t)dt = -\int_a^b f(t)dt$ • (P2) Chasle's relation $\int_a^b f(t)dt = \int_a^c f(t)dt + \int_c^b f(t)dt$ • (P3) linearity $\int_a^b \alpha f(t) + \beta g(t)dt = \alpha \int_a^b f(t)dt + \beta \int_a^b f(t)dt$ • (P4) if f(x) $\geq$ 0 over[a,b] then $\int_a^b f(x)dx \geq 0$ • (P5) if f(x) $\geq$ g(x) over[a,b] Then $\int_a^b f(x)dx \geq \int_a^b g(x)dx$ • (P6) if f is even over[-a,a] $\int_{-a}^a f(x)dx = 2\int_0^a f(x)dx$ If f is odd over[-a,a] then $\int_{-a}^a f(x)dx = 0$ • (P7) f is continuous and periodic of period T then $\int_0^T f(x)dx = \int_a^{a+T} f(x)dx$ • Decomposition of a rational function into partial fractions. • Method of change of variable • Linearization of a trigonometric polynomial by trigonometric formulas or complex numbers. • Use method of integration by parts. • Calculate area between two curves by use of integrals.

		• Calculate the volume of a solid by rotation around coordinates axes. • Calculate the approximate value of integrals by the method of rectangles.
Differential Equations (10 h)	• Identify a differential equation and determine its order. • Solve first order differential equations. • Solve second order differential equations.	• Identify vocab(order, coefficient, equation with second member, without a second member, general solution) • Solve first order diff eqs of form $y'=\int f(x)dx$ • Solve first order diff eqs of form y'+ay=0. • Solve first order diff eqs of form y'+ay=b. • Solve diff equations with independemt variables $\int f(x)dx = \int g(y)dy$ • Solve first order diff eq of form y'+ay=f(x). • Solve second order diff eq of form y''=f(x). • Solve second order diff eq of form ay''+by'+c=0. • Solve second order diff eqof form $y''+w^2y=k$.
Trigonometric functions (5h)	• Study of functions of form acos(bx+c) and a sin(bx+c)	• Distinguish amplitude, frequency and period. • Represent graphically functions of the form acos(bx+c) and a sin(bx+c)

Counting(10h)	• Factorial of a natural number • Arrangement with repetition • Arrangement without repetition • Combination • Newtons Binomial	• Applications on use of factorial • Solve word problems to distinguish between formulas.
Statistical Series in one Variable (5h)	• Statistical Vocabulary • Graphical Representation' • Characteristics of a statistical series • Use of the calculator	• Identify population , individual and character • Calculate relative frequency, cumulative frequency and cumulative relative. • Draw bar graph, circular diagram, histogram and polygon' • Calculate Mode, Median, mean, standard deviation and variance.
Probability (20h)	• Equiprobable events • Conditional probability/total probability • Tree diagram' • Random varaible	• Reminder of basic vocabulary • Calculate probability of equiuprobable events • Use tree diagram to calculate conditional probability • Distinguish independent events • Set the probability distribution table • Calculate the expected value