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Curriculum Planning Template

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| Subject: | Maths | Year | 12 |  | Pure |

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| Half Term 2 / weeks | Week 1-2 | Week 4-6 |  |  |
| Topic | Unit 21 Differentiation | Unit 22 Numerical methods | Unit 23 Integration |
| Topic overview  Pupils will learn… | To be able to differentiate expressions using the relevant rule. | To be able to use a numerical method to solve an equation/ locate a root of an equation that previously could not be dealt with. | To be able to integrate Trigonometric expressions and those involving logs. |
| Components | Students are   * Able to find the derivative of sin x and cos x from first principles. * Able to differentiate functions involving ex, ln x and related functions such as 6e4x and 5 ln 3x and sketch the graphs of these functions; * Able to differentiate to find equations of tangents and normals to the curve. * To be able to differentiate composite functions using the chain rule; * To be able to differentiate using the product rule; * To be able to differentiate using the quotient rule * To be able to differentiate parametric equations; * To be able to find the gradient at a given point from parametric equations; * To be able to find the equation of a tangent or normal (parametric); * To be able to use implicit differentiation to differentiate an equation involving two variables; * To be able to find the gradient of a curve using implicit differentiation; * To be able to verify a given point is stationary (implicit). * To be able to find and identify the nature of stationary points and understand rates of change of gradient. * To be able to use a model to find the value after a given time; * To be able to set up and use logarithms to solve an equation for an exponential growth or decay problem | Students are able   * To be able to locate roots of f(x) = 0 by considering changes of sign of f(x); * To be able to use numerical methods to find solutions of equations. * To understand the principle of iteration; * To appreciate the need for convergence in iteration; using spiral and cobweb diagrams * To be able to use iteration to find terms in a sequence * To be able to solve equations approximately using the Newton-Raphson method; * To understand how the Newton-Raphson method works in geometrical terms. | Students are able   * To integrate xn for all values of n and understand that the integral of 1/x is ln |x|; * To integrate trigonometric expressions; * To integrate expressions involving ex * To recognise integrals of the form = ln |f(x)| + c; * To use trigonometric identities to manipulate and simplify expressions to a form which can be integrated directly. |
| What pupils should already know  (prior learning components) | Functional notation including f′(x)  Coordinate geometry  Changing the subject of the formula, and substitution  Graphs of linear, quadratic and trigonometric functions  Coordinate geometry  Trigonometric identities  Differentiation | Series, sequences and recurrence relations  Graphs, roots and functions  Differentiation  Iterations and approximate areas under curves  Kinematics (velocity–time graphs) | Covered so far  • Knowledge of ex and ln x  • Laws of logarithms  • Trigonometry  • Differentiation |
| Transferrable knowledge (skills) | The effective use of the chain, product and quotient rule can now be used throughout the course to differentiate effectively including the year 12 content. | The Newton Raphson method relies on being able to use differentiation effectively, aiding in the retention of techniques previously taught. | Further practice of using the trigonometric identities is always welcome and will help solidify pupils understand and aid in retention. |
| Key vocabulary pupil will know and learn | Derivative, tangent, normal, turning point, stationary point, maximum, minimum, inflexion, parametric, implicit, differential equation, rate of change, product, quotient, first derivative, second derivative, increasing function, decreasing function. | Roots, continuous, function, positive, negative, converge, diverge, interval, derivative, tangent, chord, iteration, Newton-Raphson, staircase, cobweb, trapezium rule. | Integral, inverse, differential, coefficient, index, power, negative, reciprocal, natural logarithm, ln |x|, coefficient, exponential, identity, sin, cos, tan, sec, cosec, cot, ex. |
| Assessment activities | Homework 21a Differentiation  Homework 21b Implicit Differentiations  Test 10 | Homework 22 Numerical methods  Test 10 | Homework 23 Integration  Test 10 |
| Resources available | Pearson Pure Mathematics Year 2 Chapter 9  Topic Booklets  Departmental lesson folder  Departmental resource folder  [Physics & Maths Tutor](https://www.physicsandmathstutor.com/)  [ExamSolutions](https://www.examsolutions.net/)  [www.mathsgenie.co.uk](http://www.mathsgenie.co.uk)  [www.mathsnetalevel.com](http://www.mathsnetalevel.com) | Pearson Pure Mathematics Year 2 Chapter 10  Topic Booklets  Departmental lesson folder  Departmental resource folder  [Physics & Maths Tutor](https://www.physicsandmathstutor.com/)  [ExamSolutions](https://www.examsolutions.net/)  [www.mathsgenie.co.uk](http://www.mathsgenie.co.uk)  [www.mathsnetalevel.com](http://www.mathsnetalevel.com) | Pearson Pure Mathematics Year 2 Chapter 11  Topic Booklets  Departmental lesson folder  Departmental resource folder  [Physics & Maths Tutor](https://www.physicsandmathstutor.com/)  [ExamSolutions](https://www.examsolutions.net/)  [www.mathsgenie.co.uk](http://www.mathsgenie.co.uk)  [www.mathsnetalevel.com](http://www.mathsnetalevel.com) |
| Notes  Why this topic is important… | The unit starts with teaching the students the different methods of differentiation and what conditions must be met to use each of them in turn. It then reinforces the work completed on differentiation completed in year 12, finding tangents, normals, maximum and minimum points, using the new techniques to find the gradient functions. | The unit starts with showing pupils that not all equations can be factorised and that most equations in the “real applied world” are not easy to solve. The sign test is then used to find a location of a root within a given interval, before using iterative processes and Newton Raphson to locate the exact positions.  Discussions of efficiency and how the location of a root can affect the outcomes is used to gauge understanding. | The unit starts with recapping the techniques taught in year 12 for integrating xn expressions all except  x-1 which was previously not achievable. This then leads onto the integration of Ln expression, linking in the work done previously with partial fractions.  The unit then progresses onto integration by substitution and by parts, both are considerably challenging and require pupils to have a good grasp of previous units in differentiation and algebraic manipulation |