Spring Term plan

Year 13 Further Mathematics A Level

Mr Bullock	Mr Ahluwalia
Differential equations Find and use an integrating factor to solve first differential equations of the form $\frac{dy}{dx} + P(x)\,y = Q(x)$ Find both general and particular solutions of differential equations. Use differential equations in modelling in kinematics and in other contexts. Solve differential equations of the form $y'' + ay' + by = 0$ using the auxiliary equation. Solve differential equations of the form $y'' + ay' + by = f(x)$ by solving the homogeneous case and adding a particular integral to the complementary function. Solve the equation for simple harmonic motion $\ddot{x} = -wx$ and relate the solution to the motion Model damped oscillations using 2nd order differential equations and interpret their solutions. Understand light, critical and heavy damping and be able to determine when each will occur. Analyse and interpret models of situations with one independent variable and two dependent variables as a pair of coupled 1st order simultaneous equations and be able to solve them, for example predator-prey models. Use of Hooke's Law with $T = kx$ to formulate a differential equation for simple harmonic motion, where k is a constant. Use models for damped motion where the damping force is proportional to the velocity.	**Further Vectors** Understand and use the vector and Cartesian forms of the equation of a plane. Calculate the scalar product and use it to calculate the angle between two lines, to express the equation of a plane, and to calculate the angle between two planes and the angle between a line and a plane. Calculate and understand the properties of the vector product. Understand and use the equation of a straight line in the form $(r - a) \times b = 0$. Use vector products to find the area of a triangle. Find the intersection of two lines. Find the intersection of a line and a plane. Calculate the perpendicular distance between two lines, from a point to a line and from a point to a plane.
Half Term	
Numerical methods Use the mid-ordinate rule and Simpson's rule for integration. Understand how to use Euler's step by step method for solving first order differential equations. Use improved Euler method for solving first order differential equations. **Hypothesis testing and the t-test** Understand Type I and Type II errors and define in context. Calculate the probability of making a Type I error from tests based on a Poisson or Binomial distribution. Calculate probability of making Type I error from tests based on a normal distribution. Understand the power of a test. Calculations of P(Type II error) and power for a test for tests based on a normal, Binomial or a Poisson distribution. Test for the mean of a normal distribution with unknown variance using a t -statistic with appropriate degrees of freedom.	**Centre of mass and moments** Conditions for sliding and toppling including suspension and on an inclined plane. Determine the forces acting on a rigid body in equilibrium. Use of moments and couples.