Topic	What students need to learn:		
		Content	Guidance
9 **Differential equations**	9.1	Find and use an integrating factor to solve differential equations of form $\frac{\mathrm{d}y}{\mathrm{d}x} + P(x)y = Q(x)$ and recognise when it is appropriate to do so.	The integrating factor $\mathrm{e}^{\int P(x)\mathrm{d}x}$ may be quoted without proof.
	9.2	Find both general and particular solutions to differential equations.	Students will be expected to sketch members of the family of solution curves.
	9.3	Use differential equations in modelling in kinematics and in other contexts.	
	9.4	Solve differential equations of form $y'' + ay' + by = 0$ where a and b are constants by using the auxiliary equation.	

Topic	What students need to learn:		
	Content		Guidance
9 **Differential equations** ***continued***	9.5	Solve differential equations of form $y''+a\,y'+b\,y=\mathrm{f}(x)$ where a and b are constants by solving the homogeneous case and adding a particular integral to the complementary function (in cases where $\mathrm{f}(x)$ is a polynomial, exponential or trigonometric function).	$\mathrm{f}(x)$ will have one of the forms $k\mathrm{e}^{px}$, $A+Bx$, $p+qx+cx^2$ or $m\cos\omega x+n\sin\omega x$
	9.6	Understand and use the relationship between the cases when the discriminant of the auxiliary equation is positive, zero and negative and the form of solution of the differential equation.	
	9.7	Solve the equation for simple harmonic motion $\ddot{x}=-\omega^2 x$ and relate the solution to the motion.	
	9.8	Model damped oscillations using second order differential equations and interpret their solutions.	Damped harmonic motion, with resistance varying as the derivative of the displacement, is expected. Problems may be set on forced vibration.

Topic	What students need to learn:		
	Content		Guidance
9 **Differential equations** *continued*	9.9	Analyse and interpret models of situations with one independent variable and two dependent variables as a pair of coupled first order simultaneous equations and be able to solve them, for example predator-prey models.	Restricted to coupled first order linear equations of the form, $\frac{\mathrm{d}x}{\mathrm{d}t} = ax + by + \mathrm{f}(t)$ $\frac{\mathrm{d}y}{\mathrm{d}t} = cx + dy + \mathrm{g}(t)$