	Prelim Revision 2	60
1.	For $f(x) = \sin x \cos x$ find $f'(x)$.	2
2.	Differentiate $y = \dfrac{e^{3x}}{2x+1}$	3
3.	A geometric sequence has third and fifth terms 24 and 6 respectively	
	(a) Calculate the value of the common ratio	2
	(b) State why the associated geometric series has a sum to infinity	1
	(c) Find the value of this sum to infinity	2
4.	Matrices C and D are given by: $$C = \begin{pmatrix} -2 & -1 & 1 \\ 3 & -1 & 1 \\ 2 & 0 & -1 \end{pmatrix} \text{ and } D = \begin{pmatrix} 1 & -4 & 1 \\ k+5 & 0 & 1 \\ 2 & 1 & 0 \end{pmatrix}$$ (a) Find C^T the transpose of C (b) (i) find and simplify an expression for the determinant of D (ii) State the value of k such that D^{-1} does not exist	1 2 1
5.	Verify that $1 - 3i$ is a solution of $z^4 - 4z^3 + 11z^2 - 14z - 30 = 0$ Hence find all the solutions to $z^4 - 4z^3 + 11z^2 - 14z - 30 = 0$	5
6.	(a) Obtain partial fractions for $\dfrac{9}{x^2-9}$ (b) Hence find $$\int \frac{9}{x^2-9} \, dx$$	3 3

7.	Use Gaussian Elimination to give an expression for α in terms of λ $$x - y + 2z = -3$$ $$-x + 2y - 3z = 2$$ $$2x - y + \alpha z = 1$$ (a) Explain what happens when $\alpha = 3$ (b) Find the solution corresponding to $\alpha = -13$	6
8.	A curve is defined by the equation $xy^2 - 2x^2y = 3$ for $x > 0$ and $y > 0$ Use implicit differentiation to find the equation of the tangent to the curve when $x = 1$	5
9.	Write down and simplify the general term for $\left(3p^3 - \dfrac{2}{p}\right)^4$ Hence or otherwise find the term independent of p	5
10.	Using the substitution $t = 1 + \tan x$, show that $$\int_0^{\frac{\pi}{4}} \frac{\sec^2 x}{1 + \tan x}\, dx = \ln 2$$	4
11.	Find the Maclaurin series for $f(x) = \sin^2 x$ as far as the term in x^4	4
	Hence write down a series for $f(x) = \cos^2 x$ up to the term in x^4	1
12.	Obtain the general solution of the differential equation $$4\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + y = 3x + 10$$ Find the particular solution corresponding to the initial conditions $y = 2$ and $\frac{dy}{dx} = -3$ when $x = 0$	10