EXAMINATION HINTS

Before the examination

- Obtain a copy of the formulae book – and use it!
- Write a list of and LEARN any formulae not in the formulae book
- Learn basic definitions
- Make sure you know how to use your calculator!
- Practise all the past papers - TO TIME!

At the start of the examination

- Read the instructions on the front of the question paper and/or answer booklet
- Open your formulae book at the relevant page

During the examination

- Read the WHOLE question before you start your answer
- Start each question on a new page (traditionally marked papers) or
- Make sure you write your answer within the space given for the question (on-line marked papers)
- Draw clear well-labelled diagrams
- Look for clues or key words given in the question
- Show ALL your working - including intermediate stages
- Write down formulae before substituting numbers
- Make sure you finish a ‘prove’ or a ‘show’ question – quote the end result
- Don’t fudge your answers (particularly if the answer is given)!
- Don’t round your answers prematurely
- Make sure you give your final answers to the required/appropriate degree of accuracy
- Check details at the end of every question (e.g. particular form, exact answer)
- Take note of the part marks given in the question
- If your solution is becoming very lengthy, check the original details given in the question
- If the question says “hence” make sure you use the previous parts in your answer
- Don’t write in pencil (except for diagrams) or red ink
- Write legibly!
- Keep going through the paper – go back over questions at the end if time

At the end of the examination

- If you have used supplementary paper, fill in all the boxes at the top of every page

C4 KEY POINTS

C4 Algebra and functions

Partial fractions: Methods for dealing with degree of numerator ≥ degree of denominator, partial fractions of the form

$$\frac{2x+3}{x(x-1)(2x+1)} \equiv \frac{A}{x}+\frac{B}{x-1}+\frac{C}{2x+1} \text{ and } \frac{5-x}{(x+2)(x-3)^2} \equiv \frac{A}{x+2}+\frac{B}{x-3}+\frac{C}{(x-3)^2}$$

C4 Coordinate geometry

Changing equations of curves between Cartesian and parametric form

Use of $\int y\frac{\mathrm{d}x}{\mathrm{d}t}\,\mathrm{d}t$ to find area under a curve

C4 Sequences are series

Expansion of $(ax+b)^n$ for any rational n and for $|x| < \frac{b}{a}$, using

$$(1+x)^n = 1+nx+{}^nC_2x^2+\ldots+{}^nC_rx^r+\ldots+x^n = 1+nx+\frac{n(n-1)}{2!}x^2+\frac{n(n-1)(n-2)}{3!}+\ldots+x^n$$

where ${}^nC_r = \dfrac{n!}{r!(n-r)!}$

C4 Differentiation

Implicit and parametric differentiation including applications to tangents and normals

Exponential growth and decay

$$\frac{\mathrm{d}(a^x)}{\mathrm{d}x} = a^x \ln a$$

Formation of differential equations

C4 Integration

$$\int \mathrm{e}^x\,\mathrm{d}x = \mathrm{e}^x + c \qquad \int e^{kx}\,\mathrm{d}x = \frac{1}{k}e^{kx}+c$$

$$\int\frac{1}{x}\,\mathrm{d}x = \ln|x|+c \qquad \int\frac{1}{ax}\,\mathrm{d}x = \int\frac{1}{a}.\frac{1}{x}\,\mathrm{d}x = \frac{1}{a}\ln|x|+c_1 \quad\text{or}\quad \int\frac{1}{ax}\,\mathrm{d}x = \frac{1}{a}\ln|ax|+c_2$$

$$\int\cos kx\,\mathrm{d}x = \frac{1}{k}\sin kx + c \qquad \int\sin kx\,\mathrm{d}x = -\frac{1}{k}\cos kx + c \qquad \int\sec^2 kx\,\mathrm{d}x = \frac{1}{k}\tan kx + c$$

Use of $\displaystyle\int\frac{\mathrm{f}'(x)}{\mathrm{f}(x)}\,\mathrm{d}x = \ln|\mathrm{f}(x)|+c$ and $\displaystyle\int\mathrm{f}'(x)[\mathrm{f}(x)]^n\,\mathrm{d}x = \frac{[\mathrm{f}(x)]^{n+1}}{n+1}+c$

Integration of other trig. functions: see formulae book

Volume: use of $\int\pi y^2\,\mathrm{d}x$ when rotating about x-axis

Integration by substitution

Integration by parts

Use of partial fractions in integration
Differential equations: first order separable variables

e.g. $\mathrm{f}(x)\mathrm{g}(y)\dfrac{\mathrm{d}y}{\mathrm{d}x} = \mathrm{h}(x)\mathrm{k}(y) \quad \Rightarrow \quad \displaystyle\int \frac{\mathrm{g}(y)}{\mathrm{k}(y)}\,\mathrm{d}y = \int \frac{\mathrm{h}(x)}{\mathrm{f}(x)}\,\mathrm{d}x$

Trapezium rule applied to C3 and C4 functions

$\displaystyle\int_a^b \mathrm{f}(x)\,\mathrm{d}x \approx \tfrac{1}{2}h[y_0 + y_n + 2(y_1 + ... + y_{n-1})]$ where $y_i = \mathrm{f}(a + ih)$ and $h = \dfrac{b-a}{n}$

C4 Vectors

If $\mathbf{a} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$, $|\mathbf{a}| = \sqrt{(x^2 + y^2 + z^2)}$

If $\mathbf{a} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$, the unit vector in the direction of $\mathbf{a}$ is $[(x\mathbf{i} + y\mathbf{j} + z\mathbf{k}) \div \sqrt{(x^2 + y^2 + z^2)}]$

Scalar product:
If $\mathbf{OP} = \mathbf{p} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ and $\mathbf{OQ} = \mathbf{q} = a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$ and $\angle POQ = \theta$, then

$\mathbf{p.q} = |\mathbf{p}||\mathbf{q}|\cos\theta$ and $\mathbf{p.q} = (x\mathbf{i} + y\mathbf{j} + z\mathbf{k})\ \mathbf{.}\ (a\mathbf{i} + b\mathbf{j} + c\mathbf{k}) = xa + by + cz$

If OP and OQ are perpendicular, $\mathbf{p.q} = 0$

Vector equation of line where **a** is the position vector of a point on the line and **m** is a vector parallel to the line:
$\mathbf{r} = \mathbf{a} + \lambda\mathbf{m}$
Vector equation of line where **a** and **b** are the position vectors of points on the line:
$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{b} - \mathbf{a})$