A2 Assignment Nu Cover Sheet **Name:**

Question		Done	BP	Topic	Comment
Drill	Aa			C4 Integral – 2/cos^2	$4\tan\frac{x}{2}+c$
	Ab			C4 Integral – sec3xtan3x	$\frac{1}{3}\sec 3x+c$
	Ac			C4 Integral – cosec2xcot2x	$-\frac{1}{2}\operatorname{cosec} 2x+c$
	Ba			C3 MOD – |f(x)| solve	$2 \pm 2\sqrt{2}$ and 2
	Bb			C3 MOD – f(|x|) solve	$\pm 1, \pm 3$
	Ca			C2 Logs – solve with base change	2 or 16
	Cb			C2 logs – solve with base change	$-\frac{1}{3}, -2$
	Da			C4 Integral – Improper Partial Fractions	$x^2+2x+\frac{19}{5}\ln\lvert x+2\rvert+\frac{56}{5}\ln\lvert x-3\rvert+c$
	Db			C4 Integral – Improper Partial Fractions	$x-\ln\lvert x+1\rvert+\ln\lvert x-1\rvert+c$
Tracking Test 3	TT3Ai)			R, α transformations	
	TT3Aii)			R, α transformations	$R = 10.82$, $\alpha = 33.69$
	TT3Aiii)			R, α transformations	$x = 56.1°$ or $x = 11.3°$
	TT3B)			Implicit differentiation	$y = 2x - 2$
Current Work	1a			C3 Differentiation – Give answer in x only	$\frac{dy}{dx}=\frac{1}{x}$
	1b			C3 Differentiation – Give answer in x only	$\frac{dy}{dx}=\frac{3}{9+x^2}$
	1c			C3 Differentiation – Give answer in x only	$\frac{dy}{dx}=\frac{1}{\sqrt{1-x^2}}$
	1d			C3 Differentiation – Give answer in x only	$\frac{1}{2\sqrt{4-x^2}}$
	2a			C4 Implicit Diff – find dy/dx	$-\frac{x^2}{y^2}$
	2b			C4 Implicit Diff – find dy/dx	$\frac{dy}{dx}=\frac{2x-2cosec^2(2x+y)}{e^y+cosec^2(2x+y)}$
	2c			C4 Implicit Diff – find dy/dx	$\frac{dy}{dx}=\frac{3\sec(3x+1)\tan(3x+1)}{2y+1}$
	2d			C4 Implicit Diff – find dy/dx	$\frac{2y^3-3xy^2}{3x^2y-6xy^2}$
	2e			C4 Implicit Diff – find dy/dx	$\frac{dy}{dx}=\frac{4x^3(x^2+1)+2x-y(x^2+1)}{(x^2+1)(x+2y)}$
	2f			C4 Implicit Diff – find dy/dx	$\frac{dy}{dx}=\frac{3\cos(3x-y)+2\sec^2 2x}{3^y ln3+\cos(3x-y)}$
	3			C4 Implicit Diff – find tangent at point	$y = -x + 2$
Consoli	4			C4 Integration – Improper partial frac w/ limits	$\frac{7}{2}+\ln\left(\frac{192}{5}\right)$
	5			C3 Diff – given y=e^x/(x+1) find 1st & 2nd deriv	e/4 and e/4 ☺
	6a			M2 Kinematics vectors – given v find a	$6t\mathbf{i} + 5\mathbf{j}$ ms^{-2}

da tio n	6b			M2 Kinematics vectors – find when // to j	2
	6c			M2 Kinematics vectors – find displacement	6.10m
	7a			M2 Projectiles – find height of cliff	150m
	7b			M2 Projectiles – find speed hits ground	73 ms^{-1}
	7c			M2 Projectiles – find horizontal distance	360m (2sf)
	C3 past paper				
	8a			C3 facts about e – which statements correct?	B
	8b			C3 curve intersections – which statement corr?	E
	Challeng e				

α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	o	π	ρ	σ	τ	υ	φ	χ	ψ	ω

"Numbers written on restaurant bills within the confines of restaurants do not follow the same mathematical laws as numbers written on any other pieces of paper in any other parts of the universe." Douglas Adams

A2 Maths with Mechanics Assignment ν (nu)
INCLUDING a past paper: C3 past Jan 2009
due w/b 2nd Jan 2015

Happy Christmas

And a successful New Year!

Don't forget to do the Preparation section.

Drill

Part A Integrate with respect to x

(a) $\dfrac{2}{\cos^2\frac{x}{2}}$ (b) $\sec 3x \tan 3x$ (c) $\operatorname{cosec} 2x \cot 2x$

Part B Given that $f(x) = x^2 - 4x, \quad x \in \mathbb{R}$, solve the following equations:

(a) $|f(x)| = 4$ (b) $f(|x|) = -3$

Part C Solve the equations

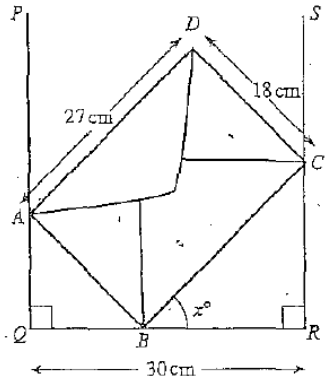
(a) $\log_2 x + 4\log_x 2 = 5$ (b) $\log_3(2-3x) = \log_9\left(6x^2 - 19x + 2\right)$

Part D Integrate the following CASE 3 improper fractions using partial fractions:

(a) $\int \frac{2x^3+x-1}{(x+2)(x-3)}\,dx$ (b) $\int \frac{x^2+1}{x^2-1}\,dx$

Focus from Tracking Test 3

TT3A



The figure shows the rectangular cross-section *PQRS* of a letter rack. A rectangular envelope *ABCD* rests in the vertical plane *PQRS* inside the letter rack. *QR* is horizontal. *QR* = 30 cm, *AD* = 27 cm and *CD* = 18 cm. the bottom edge, *BC*, of the envelope, makes an angle x° with the base *QR* of the rack.

i) Prove that $9\cos x° + 6\sin x° = 10$

ii) Express $9\cos x° + 6\sin x°$ in the form $R\cos(x° - \alpha°)$, where $R > 0$ and $0 < \alpha < 90$ giving the values of R and α to 2 decimal places.

iii) Hence, or otherwise, find x, giving your answer to the nearest tenth of a degree.

TT3B Find the equation of the normal to the curve with implicit equation $(x+y)^3 = x^2 + y$ at the point (1, 0).

Current work

1 Find $\frac{dy}{dx}$ IN TERMS OF X ONLY if: (great questions ☺)

(a) $x = e^y$ (b) $x = 3\tan y$ (c) $x = -\cos y$

(d) $x = 2sin2y$

2 Find $\frac{dy}{dx}$ using implicit differentiation in the following

(a) $x^3 + y^3 = 5$ (b) $x^2 + \cot(2x + y) = e^y$

(c) $y^2 + y = \sec(3x + 1)$

(d) $3x^2y^2 - 4xy^3 = 7$ (e) $(x + y)y - \ln(x^2 + 1) = x^4$

(f) $\sin(3x - y) + \tan(2x) = 3^y$

3. Find the equation of the tangent to the curve $x^2 + 3xy + y^2 = x + 3y + 2$ at the point (2, 0)

Consolidation

4. $\int_2^3 \frac{4x^3-1}{(x-1)^2(2x-1)}dx$ giving your answer in the form a + ln b where a and b are rational

* remember to check your partial fractions on your calculator using x = 0.01 each side before you integrate ! otherwise, you are wasting your time !! *

5. Given that $y=\frac{e^x}{x+1}$ find in terms of *e* the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1$.

Mechanics

6. The velocity $\mathbf{v}$ m s^{-1} of a particle *P* at time *t* seconds is given by

$$\mathbf{v} = (3t^2 - 12)\mathbf{i} + 5t\mathbf{j}$$

(a) Find the acceleration of *P* at time *t* seconds.

(b) Find the value of *t* when *P* is moving parallel to the vector **j**.

With respect to a fixed origin *O*, the position vector of *P* when $t = 2$ is $4\mathbf{j}$.

(c) Find the distance *OP* when $t = 1$.

7. A particle of mass 2 kg is projected off the edge of a cliff with velocity 49 ms^{-1} at an angle of 25° above the horizontal. It hits the sea after 8 seconds.

Find (a) the height of the cliff.
(b) the speed that the particle hits the sea.
(c) the horizontal distance that the particle has travelled when it hits the sea.

Past paper work

Do **C3 January 2009** available on the VLE then mark it using the mark scheme only after you have completed it in timed conditions. You may want to try doing in reverse order.
Don't forget to redo the **C3 paper in the tracking test 3** if you did not achieve your AS grade

8.

For these questions decide which of the responses given is (are) correct then choose
A if 1, 2 and 3 are correct
B if only 1 and 2 are correct
C if only 2 and 3 are correct
D if only 1 is correct
E if only 3 is correct

a)

1. The second derivative of e^{2x} is $4e^{2x}$

2. The area under the curve of e^{2x} and bounded by the lines x = 0 and x = ln2 is 3/2

3. The curve $y = e^{2x}$ has no asymptote(s)

b)

The solutions of the equation $2x^3 + 6x^2 - 1 = 0$

can be found from the intersections of the two graphs

1. $y = 2x^3$ and $y = 6x^2 - 1$

2. $y = 6 - 1/x^2$ and $y = 2x$

3. $y = x^2(x+3)$ and $y = 1/2$

Challenge

Which one of these is prime?

a) $1000^2 + 111^2$ b) $555^2 + 666^2$ c) $2000^2 - 999^2$

d) $1001^2 + 1002^2$ e) $1001^2 + 1003^2$