A2 Assignment eta Cover Sheet **Name:**

Question		Done	BP	Ready?	Topic	Answers
Drill	Aa				C3 Differentiation all methods	$e^x(\sin x+\cos x)$
	Ab				C3 Differentiation all methods	$\frac{2e^{2x}(\cos x+\sin x)}{\cos^3 x}$
	Ac				C3 Differentiation all methods	$\sin 2x\ln x+\frac{\sin^2 x}{x}$
	Ad				C3 Differentiation all methods	$\frac{\cos x}{2\sqrt{\sin x}}$
	Ae				C3 Differentiation all methods	$\cos 2x$
	Af				C3 Differentiation all methods	$\frac{1+\sin x+\cos x}{(1+\cos x)^2}$
	Ba				C3 Trig solves	π
	Bb				C3 Trig solves	$\frac{5\pi}{6},\frac{11\pi}{6}$
	Bc				C3 Trig solves	$\frac{2\pi}{3},\frac{4\pi}{3}$
	Ca				C3 Rcos	17, 5.20
	Cb				C3 Rcos	13, 0.395
	Cc				C3 Rcos	$\sqrt{10}$, 1.89
	Da				C3 Integration by inspection	$-\frac{1}{6}(2x+1)^{-3}+c$
	Db				C3 Integration by inspection	$-\frac{1}{2}(1-x)^6+c$
	Dc				C3 Integration by inspection	$2e^{\frac{1}{2}x}+c$
	Dd				C3 Integration by inspection	$-\cos(x+1)+c$
	De				C3 Integration by inspection	$\frac{1}{2}\ln\lvert 2x-3\rvert+c$
	Df				C3 Integration by inspection	$\frac{1}{3}\tan 3x+c$
	TT2A					
	TT2B					
	TT2C					
	TT2D					
nt	1				C3 Inverse trig functions	Check on google inc asymptotes
	2				C3 Inverse trig functions	$2-\sqrt{3}$
	3a				C3 Creating an iterative	$a=5, b=-1$

					formula	
	3b				C3 Creating an iterative formula	$a=5, b=-1$
	3c				C3 Creating an iterative formula	$a=\frac{1}{4}$
	3d				C3 Creating an iterative formula	$a=3, b=-\frac{1}{3}$
	3e				C3 Creating an iterative formula	$a=5$
	3f				C3 Creating an iterative formula	$a=\frac{1}{2}, b=-\frac{3}{2}$
	4				C3 Numerical methods – root	1.12
	5a				C3 Numerical methods	2.422
	5b				C3 Numerical methods – justify	Discuss in class
S1 Practice	6				M1 Force diagram with friction	a) 10.8N b) 0.725 c) F_{max}= 3.94N, 6sin25 = 2.54N, 2.54<3.94 so the weight remains in equilibrium
Consolidation	7a				C3 Functions- domain and range	(sketches, make sure they are one to one in order to have an inverse) $0 < f(x) < 1; \quad f^{-1}(x) = \frac{1-x}{x}$
	7b				C3 Functions- domain and range	$f(x) \geq 0; \quad f^{-1}(x) = (x+1)^{\frac{1}{2}} - 1$
	7c				C3 Functions- domain and range	$f(x) \geq 5; \quad f^{-1}(x) = (x-1)^{\frac{1}{2}} - 2$
	8				C3 Using dx/dy + trig ids to find dy/dx	PROOF
	9a				C3 Trig proof	PROOF
	9b				C3 Trig solve	$0, \frac{\pi}{7}, \frac{3\pi}{7}, \frac{5\pi}{7}, \pi$
	10a				C3 Trig solve	π
	10b				C3 Trig solve	$0, \pi, 2\pi$
	11				C3 Trig proof	PROOF
Challenge	12				Challenge!	1/3
					REDO C3 PAST PAPER IF <90%	REDO C3 PAST PAPER IF <90%

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

"A linguist would be shocked to learn that if a set is not closed this does not mean that it is open, or that 'E is dense in E' does not mean the same thing as 'E is dense in itself'."

J E Littlewood

A2 Maths with Mechanics Assignment η eta

(15 questions including drill plus redoing the C3 past paper June 2005 if you achieved less 90%. Due in w/b 7/11)

Maths Trip: Maths In Action University Lectures in London. £20 a ticket (10 tickets available) 15th November
Maths Trip: Maths In Action University Lectures in London. £20 a ticket (10 tickets available) 14th December

Drill

Part A Differentiate with respect to *x*:

(a) $e^x \sin x$ (b) $\dfrac{e^{2x}}{\cos^2 x}$ (c) $\sin^2 x \ln x$

(d) $\sqrt{\sin x}$ (e) $\sin x \cos x$ (f) $\dfrac{1+\sin x}{1+\cos x}$

Part B Solve these equations for $0 \leq \theta \leq 2\pi^c$

(a) $\sec\theta = -1$ (b) $\cot\theta = -\sqrt{3}$ (c) $\operatorname{cosec} \frac{1}{2}\theta = \dfrac{2\sqrt{3}}{3}$

Part C By writing each of these functions in the form given, state the greatest value of each function and the smallest positive value of *x* (in radians to 2dp) at which this occurs.

(a) $8\cos x - 15\sin x$, $R\cos(x+\alpha)$ (b) $5\sin x + 12\cos x$, $R\sin(x+\alpha)$

(c) $3\sin x - \cos x$, $R\sin(x-\alpha)$

Part D Integrate the following with respect to *x*:by considering the reverse of differentiation

(a) $\int (2x+1)^{-4} dx$ (b) $\int 3(1-x)^5 dx$ (c) $\int e^{\frac{x}{2}} dx$

(d) $\int \sin(x+1) dx$ (e) $\int \dfrac{1}{2x-3} dx$ (f) $\int \sec^2 3x \, dx$

TT2 FOCUS:

A)

B)

C)

D)

Current work :

Inverse trig, Numerical methods

1. Sketch the graph of , $y = \arcsin x$, $y = \arccos x$, $y = \arctan x$ labelling your axes and axes crossing points clearly

2. Given that $\arctan(x-2) = -\frac{\pi}{3}$, find the value of x

3, Show the steps by which the following iterative formulae can be derived from the given equations. State the values of the constants a and b in each case:

	Equation to be solved	Iterative formula
(a)	$x^2 - 5x + 1 = 0$	$x_{n+1} = \sqrt{ax_n + b}$
(b)	$x^2 - 5x + 1 = 0$	$x_{n+1} = a + \frac{b}{x_n}$
(c)	$4\ln x = x$	$x_{n+1} = e^{ax_n}$
(d)	$3e^x + x - 9 = 0$	$x_{n+1} = \ln(a + bx_n)$
(e)	$x\ln x = 5$	$x_{n+1} = e^{\left(\frac{a}{x_n}\right)}$
(f)	$2\cos x + 3x - 1 = 0$	$x_{n+1} = \arccos(a + bx_n)$

4 Given that $f(x) = 5x - 4\sin x - 2$ where x is measured in radians, show that $f(x) = 0$ has a root in the interval $(1.1, 1.15)$. Use the iterative formula $x_{n+1} = p\sin x_n + q$ (where p and q are constants to be found) and $x_0 = 1.1$ to find x_4 to 3sf.

5 The root of the equation f(x) = 0, where $f(x) = x + \ln 2x - 4$ is to be estimated using the iterative formula $x_{n+1} = 4 - \ln 2x_n$, with $x_0 = 2.4$.

(a) Showing your values of x_1, x_2, x_3,…, obtain the value, to 3 decimal places, of the root.

(b) By considering the change of sign of f(x) in a suitable interval, justify the accuracy of your answer to part (*a*).

M1 Practice (Preparation for M2)

6. A weight of 6N rests on a rough 25° incline. The perpendicular reaction is measured to be 10N. A horizontal force H pushes the weight so that it is just on the point of slipping up the plane.

   a) Complete a force diagram and find force H

   b) Find μ, the coefficient of friction.

   Force H is now removed

   c) Showing all your calculations clearly, justify whether the 6N weight will slide down the plane, or remain in equilibrium.

Consolidation

7. For each of the following functions, whose domain is the set of **positive** real numbers, sketch the function and hence state the range. For each function find its inverse

   (a) $f(x) = \dfrac{1}{x+1}$ (b) $f(x) = (x+1)^2 - 1$ (c) $f(x) = x^2 + 4x + 5$

8. Prove that if $x = \sec y$, then $\dfrac{dy}{dx} = \dfrac{1}{x\sqrt{x^2 - 1}}$

9. Using the result that $\sin P - \sin Q = 2\cos\dfrac{(P+Q)}{2}\sin\dfrac{(P-Q)}{2}$

   (a) Show that $\sin 105^\circ - \sin 15^\circ = \dfrac{1}{\sqrt{2}}$

   (b) Solve, for $0 \le \theta \le \pi, \sin 4\theta - \sin 3\theta = 0$

10. Solve the following equations on the interval $0 \le x \le 2\pi$. Give **exact** answers:

    (a) $\cos x(\sin^2 x - 1) = 1$ (b) $\cot\left(x + \dfrac{\pi}{6}\right) = \sqrt{3}$

11. Forming the factor formulae

Use the formulae for sin(A+B) and sin(A – B) to derive the result that

$$\sin P + \sin Q = 2\sin\frac{(P+Q)}{2}\cos\frac{(P-Q)}{2}$$

Challenge Question

Triangle ABC has $A\hat{B}C = 90$ and $A\hat{C}B = 30$. If a point inside the triangle is chosen at random, what is the probability it is nearer AB than it is to AC?