MEI

Mathematics in Education and Industry

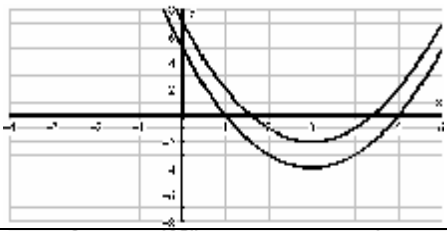
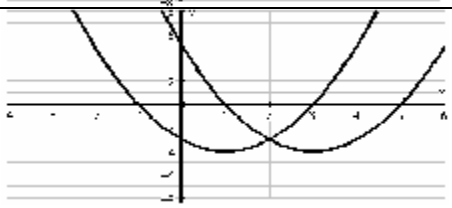
MEI STRUCTURED MATHEMATICS

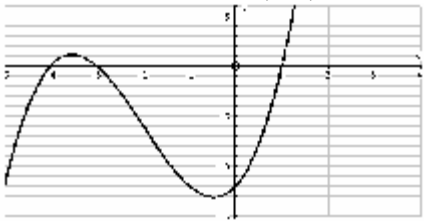
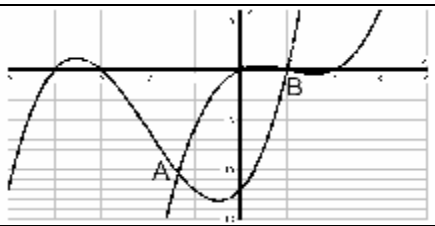
INTRODUCTION TO ADVANCED MATHEMATICS, C1

Practice Paper C1-D

MARK SHEME

Qu		Answer	Mark	Comment
Section A				
1	**(i)**	$P \Leftarrow Q$	B1 **1**	
	(ii)	$R \Rightarrow S$	B1 **1**	
2		$y = 3x + c$ $\Rightarrow 12 = 6 + c \Rightarrow c = 6$ $\Rightarrow y = 3x + 6$	M1 M1 A1 **3**	
3		Coefficients are 1 8 28 56 70 56 28 8 1 Largest term is 70	M1 A1 A1 **3**	c.a.o
4		$A = 2\pi r(r + h)$ $\Rightarrow \frac{A}{2\pi r} = r + h$ $\Rightarrow h = \frac{A}{2\pi r} - r$	M1 M1 A1 **3**	
5	**(i)**	$2^x = \frac{1}{8} = 2^{-3} \Rightarrow x = -3$	B1 **1**	
	(ii)	$x^{-\frac{1}{2}} = \frac{1}{4} \Rightarrow x^{\frac{1}{2}} = 4 \Rightarrow x = 4^2 = 16$	M1 A1 **2**	
6		$13 - x \geq 6 + 2x \Rightarrow 7 \geq 3x$ $\Rightarrow x \leq 2$ $\Rightarrow \{1, 2\}$	M1 A1 A1 **3**	Condone the inclusion of 0
7		f(2) = 8 - 4 + 4 = 8 g(-1) = k $\Rightarrow k = 4$	M1 A1 M1 A1 A1 **5**	
8		$\frac{4}{2\sqrt{3}-1} = \frac{4\left(2\sqrt{3}+1\right)}{\left(2\sqrt{3}-1\right)\left(2\sqrt{3}+1\right)}$ $= \frac{4\left(2\sqrt{3}+1\right)}{11} = \frac{4}{11} + \frac{8}{11}\sqrt{3}$ $\Rightarrow a = \frac{4}{11}, b = \frac{8}{11}$	M1 A1 M1 A1 A1 **5**	
9		$x + 2 = x^2 - 2x - 8 \Rightarrow x^2 - 3x - 10 = 0$ $\Rightarrow (x-5)(x+2) = 0 \Rightarrow x = -2, 5$ i.e.(-2,0), (5,7)	M1 A1 M1 A1 **4**	

10	**(i)**	 A (3, -2) B(5, 2)	B1 B1 B1 **3**	Curve Point A Point B
	(ii)	 A (1, -4) B (3. 0)	B1 B1 **2**	Curve Both points
Section B				
11	**(i)**	Because it is "upside down" or words to that effect	B1 **1**	
	(ii)	$(x - 1)$ and $(x - 3)$	B1 B1 **2**	
	(iii)	$y = k(x - 1)(x - 3)$ Through (0, -6) $\Rightarrow k = -2$ $\Rightarrow a = -2, b = 8, c = -6$	M1 A1 A1 A1(all) **4**	
	(iv)	$y = x^2 - 4x + 10 = x^2 - 4x + 4 + 6$ $\Rightarrow y = (x - 2)^2 + 6$	M1 A1 **2**	
	(v)	Minimum value of this function is 6 and it is "right way up"	B1 B1 B1 **3**	Minimum 6 right way up

12	**(i)**	f(-3) = 0	B1 **1**	
	(ii)	Either: Divide out $\Rightarrow f(x) = (x+3)(x^2+3x-4)$ $= (x+3)(x+4)(x-1)$ Or: Trial and error $\Rightarrow$ f(1) = 0, f(-4) = 0	M1 A1 A1 **3**	
	(iii)	Cuts axis when x = 1, -3, -4 	B1 B1 B1 **3**	Through points given Curve
	(iv)		B1 B1 **2**	Through points Curves and labels
	(v)	$x^3+6x^2+5x-12 = x(x-1)(x-2) = x^3-3x^2+2x$ $\Rightarrow 9x^2+3x-12=0 \Rightarrow 3x^2+x-4=0$ $\Rightarrow (x-1)(3x+4)=0$ $\Rightarrow$ A is when $x=1$; B is when $x=-\frac{4}{3}$	M1 A1 A1 **3**	

13	**(i)**	Grad BC = -1$\Rightarrow$Grad XQ = 1. Q is (4,4) $\Rightarrow y = x$ P is (3,2) $\Rightarrow$XP is x = 3 $\Rightarrow$ X (3,3)	B1 B1 B1 M1 A1 **5**	
	(ii)	$XA = \sqrt{(3-0)^2+(3-2)^2} = \sqrt{10}$ $XB = \sqrt{(3-2)^2+(3-6)^2} = \sqrt{10}$ $XC = \sqrt{(3-6)^2+(3-2)^2} = \sqrt{10}$ Alternative argument: XA = XC because on XP XB = XC because on XQ Therefore XA = XB = XC Then probably in (iii), $XA = \sqrt{(3-0)^2+(3-2)^2} = \sqrt{10}$	M1 A1 A1 B1 M1 A1 **3**	One Other two
	(iii)	$(x-3)^2+(y-3)^2 = 10$	B1 B1 **2**	LHS RHS
	(iv)	$y=0 \Rightarrow x^2-6x+8=0$ $\Rightarrow x = 4, 2$	M1 A1 **2**	