Pure Core 1 Past Paper Questions: Mark Scheme

Taken from MAP2

June 2001

3 (a)	Sub: $y = x + 1$	M1		
	Simplify to $x^2 - 4x + 4 = 0$	A1		
	$\Rightarrow (x-2)^2 = 0$	M1		
	$x = 2, \quad y = 3$	A1	4	Must have both
(b)	Tangent	B1		Must have supporting evidence / reason
	Equal roots or ≡	B1	2	for B1
	Total		**6**	
4 (a)	$\mathrm{f}(x) = (x-a)Q(x)$	M1		
	$x = a$ then $\mathrm{f}(a) = 0$	A1	2	
(b)	$\mathrm{f}(1) = 1 + p + q + 6 = 0$	M1		For factor theorem $[\mathrm{f}(1) = 0]$
	$(p + q = -7)$			
	$\mathrm{f}(-1) = -1 + p - q + 6 = 8$	M1		for remainder theorem $[\mathrm{f}(-1) = 8]$
	$(p - q = 3)$			
	$p = -2$	A1		CAO
	$q = -5$	A1	4	√
	Total		**6**	

January 2002

6 (a)	$y = 5 - x$	M1A1	2	Reasonable attempt at line between correct points for M1
(b)	Perpendicular through C: $y = x - 1$	M1A1F	2	f.t. slope in (a), using point C
(c)	$x = 3$ $y = 2$	M1		M1 for equating (their) correct lines M1A1 CAO
	(3,2)	A1	2	
(d)	Radius = $\sqrt{8}$	B1F		f.t. radius in (c)
	Circle: $(x-5)^2 + (y-4)^2 = 8$	B1	2	
	Total		**8**	

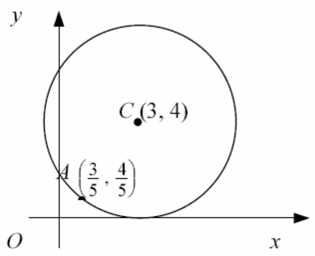
June 2002

Q	Solution	Marks	Total	Comments
1	Division process	M1		
	$x^2 + x(-6)$	A1		
	Fully correct	A1	(3)	NMS 3/3 SC: $(x+1)(x^2 + x - 6)$ M1A1A0
	Total		**(3)**	

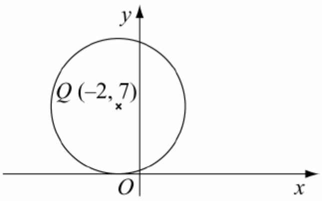
Q	Solution	Marks	Total	Comments
6 (a)	$(x+1)^2+(y-3)^2=10$	M1A1		Completing square; not necessarily in final form shown here
	Centre $(-1, 3)$	A1√		} implies previous M1A1
	Radius $\sqrt{10}$	A1√	4	
(b)	Slope of line through (2, 4) and their centre $((-1, 3))$	M1		**Alternative** Find gradient of tangent by differentiating eg $x^2+y^2+2x-6y=0$
	$=+\frac{1}{3}$	A1√		$2x+2yy'+2-6y'=0$ M1-must have $2yy'$ A1-fully correct
	$\Rightarrow$ slope of tangent $=-3$	B1√		Subs for slope $(=-3)$ B1√
	Tangent $\frac{y-4}{x-2}=-3$	M1		Then as on LHS for M1,A1
	$y+3x=10$	A1	5	(Any form)
	Total		**(9)**	

January 2003

Q	Solution	Marks	Total	Comments
1	Substitute $x=\pm 3$	M1		
	$x=-3$ correctly substituted	A1		
	$p=-3$	A1F	3	Division earns 0 marks
	Total		**3**	

3 (a)	$\left(\frac{3}{5}-3\right)^2+\left(\frac{4}{5}-4\right)^2=\left(\frac{12}{5}\right)^2+\left(\frac{16}{5}\right)^2=16$	B1	1	Or use of $x^2+y^2-6x-8y+9=0$
(b)		B1		Centre (PI)
		B1	2	Touching Ox
(c)	Gradient of OA, AC or OC found.	B1		This mark can be awarded in part (d) if not earned here
	Method to show O, A, C are colinear (e.g. show grad OA = grad AC or find the equation of AC and show that O lies on it).	M1		
	Accurate completion	A1	3	
(d)	Grad of $T_A=-\frac{3}{4}$	B1F		Or find $\frac{dy}{dx}=\frac{6-2x}{2y-8}\Rightarrow y'=-\frac{3}{4}$
	T_A : $y-\frac{4}{5}=-\frac{3}{4}\left(x-\frac{3}{5}\right)$	M1A1F		
	$15x+20y=25$	A1F	4	OE a, b, c integers
	$3x+4y=5$			
	Total		**10**	

June 2003

Q	Solution	Marks	Total	Comments
6 (a)	$x^2 + y^2 + 4x - 14y + 4 = 0$	M1		attempt to complete squares
	$(x+2)^2 + (y-7)^2 = 49$	A1 A1		for $(x+2)^2$ for $(y-7)^2$
	Radius 7 or $\sqrt{49}$	A1		(CAO)
	Centre (–2, 7)	A1F	5	
(b)		B1F B1F	2	Centre in 2nd quadrant Touching Ox
(c)	$PQ^2 = 8^2 + 1^2 (= 65)$	M1A1F		
	$PR^2 = PQ^2 - QR^2$	M1		
	$PR^2 = 65 - 49 = 16 \Rightarrow PR = 4$	A1F	4	
	Total		**11**	

January 2004

Q	Solution	Marks	Total	Comments
2 (a)(i)	Centre $(2\,,\,-2)$	B1		
(ii)	Complete the square $(x-2)^2 + (y+2)^2 = 20$ $\therefore r^2 = 20$ $r = \sqrt{20}$ or (AWRT 4.47)	M1 A1 A1 A1√	5	Attempted LHS correct RHS correct (on their RHS > 0)
(b)	Crosses x-axis when $y = 0$	M1		For use of $y = 0$
	$\therefore x^2 - 4x - 12 = 0$ $(x-6)(x+2) = 0$ $x = 6$ or $x = -2$	m1		For solving quadratic by any correct method attempted
	$\therefore$ crosses x-axis at the points $(6\,,\,0)$ & $(-2\,,\,0)$	A1	3	Accept $x = 6$ *and* $x = -2$ if $y = 0$ used
(c)	Slope of radius $= \dfrac{2 - -2}{4 - 2} = \dfrac{4}{2} = 2$	B1√		On their centre
	Use $m_1 m_2 = -1$ for perpendicular lines $\therefore$ slope of tangent $= -\dfrac{1}{2}$	B1√		On their slope of radius
	Equation of tangent is $y - 2 = -\dfrac{1}{2}(x - 4)$	M1		If $m_1 m_2 = -1$ used then: use of $y - y_1 = m(x - x_1)$ or any other correct method
	$2y - 4 = -x + 4$ $x + 2y - 8 = 0$	A1√	4	Accept any simplified form (on their value of m)
	Total		**12**	

Q	Solution	Marks	Total	Comments
6(a)(i)	$C(4,\ 3)$	B1		
(ii)	$r=2$	B1	2	
(b)(i)	$(x-4)^2+(y-3)^2=4$ and $y=x+1$			
	meet when $(x-4)^2+(x+1-3)^2=4$	M1		Substitution attempted or eliminating x
	$\Rightarrow \quad (x-4)^2+(x-2)^2=4$			
	$(x^2-8x+16)+(x^2-4x+4)=4$	M1		Multiply out correctly and simplification attempted
	$2x^2-12x+20=4$			
	$x^2-6x+8=0$	A1		quadratic
	$(x-4)(x-2)=0$	M1		factorise/other valid method attempted
	$x=4$ or $x=2$			
	$x=4 \Rightarrow y=5$; $x=2 \Rightarrow y=3$; $A(4,\ 5)$ & $B(2,\ 3)$	A1ft	5	Both points (cao)