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GCE

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Pure Mathematics P1 (6671)

Summer 2005

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Mark Scheme (Results)

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June 2005
6671 Pure P1
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Question Number	Scheme	Marks
1	(a) $\frac{dy}{dx} = 6 + 8x^{-3}$ or equiv.	M1 A1
		(2)
	[M1 is for correct power of x in at least one term , 6 or x^{-3} is sufficient.]	
	(b) $\int y\,dx = \frac{6x^2}{2} + 4x^{-1} + C$ or equiv.	M1 A1A1
		(3)
	[A1: $\frac{6x^2}{2} + C$; A1: $+4x^{-1}$]	
		[5]
2	(a) $a = -4$ or $(x-4)^2$	B1
	$x^2 - 8x - 29 \equiv (x \pm 4)^2 - 16$ (-29), $b = -45$	M1A1
		(3)
	[Comparing coefficients: M1 is for $a^2 + b = -29$, and comparing x coefficient]	
	(b) Method to find x:	M1
	[x + "a" $= \sqrt{}$........ *or* x using the quadratic formula	
	$x = 4 \pm 3\sqrt{5}$ or $c = 4$, $d = 3$	A1 A1
		(3)
		[6]

Question Number	Scheme	Marks
3	(a) $r\theta = 45\theta = 63, \quad \theta = 1.4$ (*)	M1A1 (2)
	(b) Area of sector $OAB = \frac{1}{2}r^2\theta = \frac{1}{2}45^2 \times 1.4$ $(= 1417.5)$	M1A1
	Complete method for area of triangle OCD	M1
	Correct numerical expression for area : e.g. $\frac{1}{2}30^2 \times \sin 1.4$ (= 443.45...)	A1
	Shaded area = 1417.5 – 443.45…= 974 m^2 cao	A1 (5) **[7]**
4	(a) Complete method for equation of line e.g. $y - (-4) = \frac{1}{3}(x - 9)$	M1A1
	$x - 3y - 21 = 0$ or $3y - x + 21 = 0$	A1 (3)
	(b) Equation of l_2: $y = -2x$	B1
	Solve l_1 *and* l_2 simultaneously to find *P*:	M1
	$x = 3, \quad y = -6$	A1A1√
	[Follow through on first co-ord substituted in $y = -2x$]	(4)
	(c) *C*: $(0, -7)$	B1√
	Complete method for area of triangle *OCP*	M1
	Area $= 10\frac{1}{2}$ (must be exact)	A1 (3) **[10]**

5	(a) $\arctan\frac{3}{2} = 56.3° \ (= \alpha)$ seen anywhere	B1
	$\alpha - 20°$, $(\alpha - 20°) \div 3$ (that order)	M1M1
	$\alpha + 180°$ (= 236.3°), $\alpha - 180°$ (= −123.7°) (Third quadrant)	M1
	$x = -47.9°,\ 12.1°,\ 72.1°$	A1A1
	[First A1 for two correct solutions, second A1 for third]	(6)
	(b) Equation in one trig. function, using correct identities	M1
	[e.g. $2\sin^2 x + (1 - \sin^2 x) = \frac{10}{9}$ or $2(1 - \cos^2 x) + \cos^2 x = \frac{10}{9}$]	
	$\sin^2 x = \frac{1}{9}$ or $\cos^2 x = \frac{8}{9}$ or $\tan^2 x = \frac{1}{8}$ or $\cos 2x = \frac{7}{9}$	A1
	$x = 19.5°,\ -19.5°$	A1A1√ (4) **[10]**
	Notes : Max. deduction of 1 overall for not correcting to 1 dec. place. Answers outside given interval, ignore Extra answers in range, max. deduction of 1 in each part (i.e. 4 or more answers within interval in (a), –1 from any gained A marks; 3 or more answers within interval in (b), –1 from any gained A marks	

6	(a) $S = a + (a + d) + (a + 2d) + \ldots + [a + (n-1)d]$ or equiv. form	B1
	$S = [a + (n-1)d] + [a + (n-2)d] + \ldots + a$ or equiv.	M1
	Add: $2S = n[2a + (n-1)d] \Rightarrow S = \frac{1}{2}n[2a + (n-1)d]$ cso (*)	M1 A1 (4)
	[If using "l", second M not gained until "l = a + (n – 1)d" substituted.]	
	(b) 3, 8, 13	B1 (1)
	(c) $a = 3$ $d = 5$ $[a = 3, l = 5n - 2]$	B1√
	Sum $= \frac{1}{2}n[(2 \times 3) + 5(n-1)]$ *or* $\frac{1}{2}n[3 + 5n - 2] = \frac{1}{2}n(5n+1)$ (*)	M1 A1 (3)
	Alt: $5\sum r - \sum 2$ Bl, $= \frac{5n(n+1)}{2} - 2n$ M1, $= \frac{n(5n+1)}{2}$ A1	
	(d) Finding $\sum_{1}^{200}$ e.g. $\sum_{r=1}^{200}(5r-2) = \frac{1}{2} \times 200 \times 1001$ (= 100100)	M1
	Sum of first 4 terms: $\sum_{r=1}^{4}(5r-2) = \frac{1}{2} \times 4 \times 21$ or 42 stated	B1
	$\sum_{r=5}^{200}(5r-2) = \text{S}(200) - \text{S}(4) = 100100 - 42 = 100058$	M1 A1 (4) **[12]**
	[Allow S(200) - S(5) for second M1]	
	ALT: Working with 23, 28, 33, …………	
	$a = 23$ B1; Finding "n" and d, or equiv. M1	
	Applying $S = \frac{1}{2}n[2a + (n-1)d]$, or equivalent, with 23, $n =$ 196 , $d = 5$ M1	
	Answer: 100058 A1	

7	(a) $\dfrac{dy}{dx} = 3x^{\frac{1}{2}} - 6$	M1 A1
	Setting = 0 and solving , $x = 4$ (*)	M1 A1 (4)
	(b) $\int\left(2x^{\frac{3}{2}} - 6x + 10\right)\,dx = \left[\dfrac{4x^{\frac{5}{2}}}{5} - 3x^2 + 10x\right]$	M1 A1 A1
	[$\dfrac{4x^{5/2}}{5}$ A1, $-3x^2 + 10x$ A1]	
	$\left[\dfrac{4x^{\frac{5}{2}}}{5} - 3x^2 + 10x\right]_1^4 = \left(\dfrac{4\times 4^{\frac{5}{2}}}{5} - (3\times16) + 40\right) - \left(\dfrac{4}{5} - 3 + 10\right)$	M1 A1√
	(= 17.6 – 7.8 = 9.8)	
	[A1√ requires 1 and 4 substituted in candidate's 3-termed integrand (unsimplified)]	
	Correct method for finding area under line	M1
	Correct unsimplified form e.g $= \dfrac{1}{2}(6+2)\times 3$ (= 12)	A1
	Area of R (=12 – 9.8) = 2.2	A1 (8) **[12]**
	Alt: Working with "line – curve"	
	Area = $\int \lvert (-\frac{8}{3} + \frac{14}{3}x - 2x^{\frac{3}{2}}) \rvert \,dx$ M1A1	
	$= \left[\dfrac{4x^{\frac{5}{2}}}{5},\quad \dfrac{7}{3}x^2 - \dfrac{8}{3}x\right]$ A1 A1 f.t.	
	Use of correct limits, as in main scheme M1A1 f.t.	
	2.2 A1	

8	(a) Substitution of $x = 3$ in f(x) $\quad f(3) = 27 - 117 + 165 - 75$	M1
	$= 0$, so $(x - 3)$ is a factor of $f(x)$	A1 (2)
	(b) Finding quadratic factor: $(x - 3)(x^2 - 10x + 25)$	M1 A1
	$(x - 3)(x - 5)(x - 5)$	A1 (3)
	[S.C.: Allow M1 if just a second linear factor found]	
	(c) 3 and 5	B1 (1)
	(d) $f'(x) = 3x^2 - 26x + 55$	M1 A1
	$f'(3) = 27 - 78 + 55 = 4$	A1 (3)
	(e) "$3x^2 - 26x + 55$" = "4"	M1
	$3x^2 - 26x + 51 = 0 \Rightarrow (3x - 17)(x - 3) = 0$ or $x = ...$if using "formula"	M1 A1√
	x-coordinate of S is $\frac{17}{3}$ $\left(\frac{34}{6} \text{ or } 5\frac{2}{3} \text{ or } 5.\dot{6} \text{ or } 5.67\right)$	A1 (4) **[13]**