EDEXCEL PURE MATHEMATICS P1 (6671) – JUNE 2003   PROVISIONAL MARK SCHEME

Question Number		Scheme	Marks
1.	(a)	$y = 5x - x^{-1} + C$	M1 A2 (1,0)
	(b)	$7 = 5 - 1 + C,$ $\qquad$ $C = 3$	M1 A1 ft
		$x = 2:$ $\qquad$ $y = 10 - \dfrac{1}{2} + 3 = 12\dfrac{1}{2}$	M1 A1
			(7 marks)
2.	(a)	$6x - 2x < 3 + 7$ $\qquad$ $x < 2\dfrac{1}{2}$	M1 A1
	(b)	$(2x - 1)(x - 5)$ $\qquad$ Critical values $\dfrac{1}{2}$ and 5	M1 A1
		$\dfrac{1}{2} < x < 5$	M1 A1 ft
	(c)	$\dfrac{1}{2} < x < 2\dfrac{1}{2}$	B1 ft
			(7 marks)
3.	(a)(i)	$a + (n - 1)d = 280 + (35 \times 5) = 455$	M1 A1
	(ii)	$\dfrac{1}{2} n\,[2a + (n - 1)d\,] = 18\,[560 + (35 \times 5)] = 13\,230$	M1 A1 ft
	(b)	$18\,[560 + (35 \times d)]$ $\quad = 17\,000$	M1 A1
		$d = 10.98\ldots$ $\quad x = 11$ (allow 11.0 or 10.98 or 10.99 or $10\frac{62}{63}$)	M1 A1
			(8 marks)

(ft = follow-through mark)

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4.	(*a*)	$\frac{1}{2}r^2\theta = \frac{1}{2}r^2 \times 1.5 = 15$	M1 A1
		$r^2 = 20 = \sqrt{(4 \times 5)}$ $r = 2\sqrt{5}$ (*)	A1
	(*b*)	$r\theta + 2r = 3\sqrt{5} + 4\sqrt{5} = 7\sqrt{5}$ cm (or 15.7, or a.w.r.t 15.65….)	M1 A1
	(*c*)	ΔOAB: $\frac{1}{2}r^2 \sin\theta = 10 \sin 1.5 \ (= 9.9749\ldots)$	M1
		Segment area $= 15 - \Delta OAB = 5.025$ cm^2	M1 A1
			(8 marks)
		$2\cos^2\theta - \cos\theta - 1 = 1 - \cos^2\theta$	M1
		$3\cos^2\theta - \cos\theta - 2 = 0$	A1
		$(3\cos\theta + 2)(\cos\theta - 1) = 0$ $\cos\theta = -\frac{2}{3}$ or 1	M1 A1
		$\theta = 0$ $\theta = 131.8°$	B1 A1
		$\theta = (360 - \text{"}131.8\text{"})° = 228.2°$	M1 A1 ft
			(8 marks)
6.	(*a*)	$m = \frac{2-6}{12-4}\left(= -\frac{1}{2}\right)$	M1 A1
		$y - 6 = (\text{their } m)(x-4)$ $x + 2y = 16$	M1 A1
	(*b*)	$y = -4x$	B1
	(*c*)	$x + 2(-4x) = 16$ $-7x = 16$ $x = -\frac{16}{7}$	M1 A1
		$y = \frac{64}{7}$	A1 ft
		$A\,(4, 6), \ C\left(-\frac{16}{7}, \frac{64}{7}\right): \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \rightarrow \left(\frac{6}{7}, \frac{53}{7}\right)$	M1 A1 ft
			(10 marks)

(ft = follow-through mark)

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Question Number	Scheme	Marks
7. (a)	$x^2 - 2x + 3 = 9 - x$	M1
	$x^2 - x - 6 = 0 \qquad (x+2)(x-3) = 0 \qquad x = -2,\ 3$	M1 A1
	$\hspace{8cm} y = 11,\ 6$	M1 A1 ft
(b)	$\int \left(x^2 - 2x + 3\right)\mathrm{d}x = \dfrac{x^3}{3} - x^2 + 3x$	M1 A1
	$\left[\dfrac{x^3}{3} - x^2 + 3x\right]_{-2}^{3} = (9 - 9 + 9) - \left(\dfrac{-8}{3} - 4 - 6\right) \qquad \left(= 21\dfrac{2}{3}\right)$	M1 A1
	Trapezium: $\quad \dfrac{1}{2}(11 + 6) \times 5 \hspace{4cm} \left(= 42\dfrac{1}{2}\right)$	B1 ft
	Area $= 42\dfrac{1}{2} - 21\dfrac{2}{3} = 20\dfrac{5}{6}$	M1 A1
	Alternative: $\quad (9 - x) - (x^2 - 2x + 3) = 6 + x - x^2$	M1 A1
	$\int \left(6 + x - x^2\right)\mathrm{d}x = 6x + \dfrac{x^2}{2} - \dfrac{x^3}{3}$	M1 A1 ft
	$\left[6x + \dfrac{x^2}{2} - \dfrac{x^3}{3}\right]_{-2}^{3} = \left(18 + \dfrac{9}{2} - 9\right) - \left(-12 + 2 + \dfrac{8}{3}\right), = 20\dfrac{5}{6}$	M1 A1, A1
		(12 marks)

(ft = follow-through mark)

Question Number		Scheme	Marks
8.	(a)	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = 4x^3 - 16x$	M1 A1
	(b)	$4x^3 - 16x = 0$	M1
		$4x(x^2 - 4) = 0$ $\qquad\qquad x = 0,\ 2,\ -2$	A2 (1, 0)
		$\qquad\qquad\qquad\qquad y = 3,\ -13,\ -13$	M1 A1
	(c)	$\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2} = 12x^2 - 16$	M1
		$x = 0$ $\quad$ Max. $\qquad\qquad\qquad\qquad$ One of these, ft	A1ft
		$x = 2$ $\quad$ Min.	
		$x = -2$ $\quad$ Min. $\qquad\qquad\qquad\qquad$ All three	A1
	(d)	$x = 1:$ $\qquad y = 1 - 8 + 3 = -4$	B1
		At $x = 1$, $\qquad \dfrac{\mathrm{d}y}{\mathrm{d}x} = 4 - 16 = -12$ $\quad$ (m)	B1 ft
		Gradient of normal $= -\dfrac{1}{m}$ $\qquad\left(=\dfrac{1}{12}\right)$	M1
		$y - (-4) = \dfrac{1}{12}(x - 1)$ $\qquad x - 12y - 49 = 0$	M1 A1
			(15 marks)

(ft = follow-through mark)