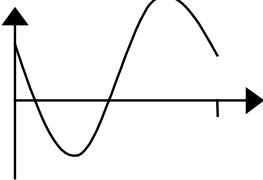


Question number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	$p + 6 + 12 + q = -\frac{1}{8}p + \frac{6}{4} - 6 + q$ $\therefore \frac{9}{8}p = -22\frac{1}{2}$ $p = -20$ <p>Remainder = $p + q + 18 = p + 21 (=1)$</p>	<p>M1 , M1</p> <p>M1</p> <p>A1 (4)</p> <p>B1√ ft on p (1)</p> <p>(5 marks)</p>
<p>2. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$a = 4, b = 5$ (both are required)</p> <p>$(x - 4)^2 + (y - 5)^2 = 25$</p> <p>Finding the distance between centre and $(8, 17), \sqrt{[(8 - a)^2 + (17 - b)^2]}$</p> <p>Complete method to find PT, i.e. use Pythagoras theorem and subtraction, $PT = 11.6$</p>	<p>B1 (1)</p> <p>M1A1ft (2)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p>(6 marks)</p>
<p>3. (a)</p> <p>(b)</p>	<p>$4x + 9, +12\sqrt{x}$</p> <p>$\int (4x + 12x^{\frac{1}{2}} + 9) dx = 2x^2 + 8x^{\frac{3}{2}} + 9x$ (dep. on 3 terms)</p> <p>$[\dots]_1^2 = (8 + (8 \times 2^{\frac{3}{2}}) + 18) - (2 + 8 + 9)$</p> <p>$= 7 + 16\sqrt{2}$</p>	<p>B1, B1 (2)</p> <p>M1 A1 ft</p> <p>M1</p> <p>M1 A1 (5)</p> <p>(7 marks)</p>
<p>4.</p>	<p>$(1 + px)^n \equiv 1 + np x, + \frac{n(n - 1)p^2 x^2}{2} + \dots$</p> <p>Comparing coefficients: $np = -18, \frac{n(n - 1)}{2} = 36$</p> <p>Solving $n(n - 1) = 72$ to give $n = 9; p = -2$</p>	<p>B1, B1</p> <p>M1, A1</p> <p>M1 A1; A1 ft</p> <p>(7 marks)</p>

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<p>5. (a)</p> <p>(b)</p>	<p>$\theta = -15^\circ, \theta = 345^\circ$ One of these...</p> <p>$\theta + 75 = 360 - "60"$</p> <p>$\theta = 225, 345$</p> <p>$(2\theta) = 44.4$</p> <p>$(2\theta) = 135.6$ One more sol.</p> <p>$(2\theta) = 404.4$ 495.6 Other 2 in range</p> <p>$\theta = 22.2, 67.8, 202.2, 247.8$ ($\div 2$)</p>	<p>B1</p> <p>M1</p> <p>A1 (3)</p> <p>B1</p> <p>B1 ft</p> <p>B1 ft</p> <p>M1 A1 (5)</p> <p>(8 marks)</p>
<p>6. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$\log_2(16x) = \log_2 16 + \log_2 x$</p> <p>$= \underline{\underline{4 + a}}$</p> <p>$\log_2\left(\frac{x^4}{2}\right) = \log_2 x^4 - \log_2 2$</p> <p>$= 4\log_2 x - \log_2 2$</p> <p>$= \underline{\underline{4a - 1}}$ (accept $4\log_2 x - 1$)</p> <p>$\frac{1}{2} = 4 + a - (4a - 1)$</p> <p>$a = \frac{3}{2}$</p> <p>$\log_2 x = \frac{3}{2} \Rightarrow x = 2^{\frac{3}{2}}$</p> <p><u>$x = \sqrt{8}$ or $2\sqrt{2}$ or $\sqrt{2^3}$ or $(\sqrt{2})^3$</u></p>	<p>M1</p> <p>A1 c.a.o (2)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1 (4)</p> <p>(9 marks)</p>

Question number	Scheme	Marks
<p>7. (a)</p>  <p>(b) $\left(0, \frac{1}{\sqrt{2}}\right), \left(\frac{\pi}{4}, 0\right), \left(\frac{5\pi}{4}, 0\right)$</p> <p>(c) $\left(x + \frac{\pi}{4} = \right) \frac{\pi}{3}$</p> <p>Other value $\left(2\pi - \frac{\pi}{3} = \right) \frac{5\pi}{3}$</p> <p>Subtract $\frac{\pi}{4} \quad x = \frac{\pi}{12}, x = \frac{17\pi}{12}$</p>	<p>Shape Position</p> <p>B1 B1 (2)</p> <p>B1 B1 B1 (3)</p> <p>B1</p> <p>M1</p> <p>M1 A1 (4)</p> <p>(9 marks)</p>	
<p>8. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$y = x(x^2 - 6x + 9) = x(x - 3)^2, (*) \quad A(3,0)$</p> <p>$\frac{dy}{dx} = 3x^2 - 12x + 9$</p> <p>$3(x^2 - 4x + 3) = 0 \quad 3(x - 1)(x - 3) = 0$</p> <p>At B, $x = 1 \quad y = 4 \quad (1,4)$</p> <p>$\int (x^3 - 6x^2 + 9x) dx = \frac{1}{4}x^4 - 2x^3 + \frac{9}{2}x^2$</p> <p>$\left[\frac{1}{4}x^4 - 2x^3 + \frac{9}{2}x^2\right]_0^3 = \frac{81}{4} - 54 + \frac{81}{2} = 6\frac{3}{4}$</p>	<p>B1, B1 (2)</p> <p>M1 A1</p> <p>M1 A1</p> <p>A1 (5)</p> <p>M1 A2, 1,0</p> <p>M1 A1 (5)</p> <p>(12 marks)</p>

Question number	Scheme	Marks
9.	(a) $100 = 81 + 25 - (2 \times 9 \times 5 \cos BAC)$	M1 A1
	$\cos BAC = \frac{81+25-100}{90} = \frac{1}{15}, BAC = 1.504 \text{ radians.} \quad *$	A1 (3)
	(b) $\frac{1}{2} r^2 \theta = \frac{1}{2} \times 9 \times 1.504 = 6.768 \text{ cm}^2$	M1 A1 (2)
	(c) Area of triangle = $\frac{1}{2} \times 45 \times \sin 1.504$ (= 22.450 cm ²)	M1 A1
	Shaded area = $22.450 - 6.768 = 15.682 \text{ cm}^2$ (15.68, 15.7)	A1 (3)
	(d) Arc length = $r\theta = 3 \times 1.504$ (= 4.512 cm) Perimeter = $10 + 6 + 2 + 4.512 = 22.512 \text{ cm}$ (22.51, 22.5)	M1, A1 M1 A1 ft (4) (12 marks)