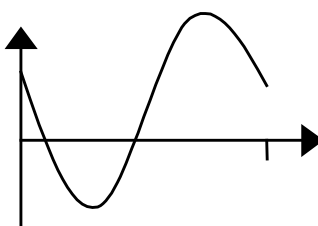


Edexcel GCE
Core Mathematics C2
Practice Paper B8
(Mark Scheme)

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Question number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	<p>$f(-2) = (-2)^3 - (19 \times -2) - 30$ M: Evaluate $f(-2)$ or $f(2)$</p> <p>$f(-2) = 0$, so $(x + 2)$ is a factor</p> <p>$(x^3 - 19x - 30) = (x + 2)(x^2 - 2x - 15)$</p> <p>$= (x + 2)(x + 3)(x - 5)$</p>	<p>M1</p> <p>A1 (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>(6 marks)</p>
<p>2. (a)</p> <p>(b)</p>	<p>$(x^3)^{12}; \dots + \binom{12}{1}(x^3)^{11}\left(-\frac{1}{2x}\right) + \binom{12}{2}(x^3)^{10}\left(-\frac{1}{2x}\right)^2 + \dots$</p> <p>[For M1, needs binomial coefficients, nC_r form OK, at least as far as shown]</p> <p>Correct values for nC_r s: 12, 66, 220 used (may be implied)</p> <p>$(x^3)^{12} + 12(x^3)^{11}\left(-\frac{1}{2x}\right) + 66(x^3)^{10}\left(-\frac{1}{2x}\right)^2 + 220(x^3)^9\left(-\frac{1}{2x}\right)^3 \dots$</p> <p>$x^{36} - 6x^{32} + \frac{33}{2}x^{28} - \frac{55}{2}x^{24}$</p> <p>Term involving $(x^3)^3\left(-\frac{1}{2x}\right)^9$;</p> <p>coeff = $\frac{12 \cdot 11 \cdot 10}{3 \cdot 2 \cdot 1}\left(-\frac{1}{2}\right)^9$</p> <p>$= -\frac{55}{128}$ (or -0.4296875)</p>	<p>B1; M1</p> <p>B1</p> <p>A2(1,0) (5)</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>(8 marks)</p>

Question number	Scheme	Marks
<p>3. (a)</p> <div style="text-align: center;">  </div> <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) $\left(x + \frac{\pi}{4} = \right) \frac{\pi}{3}$ Other value $\left(2\pi - \frac{\pi}{3} = \right) \frac{5\pi}{3}$ Subtract $\frac{\pi}{4}$ $x = \frac{\pi}{12}, x = \frac{17\pi}{12}$</p>	<p style="text-align: right;">Shape</p> <p style="text-align: right;">Position</p>	<p>B1</p> <p>B1 (2)</p> <p>B1, B1, B1 (3)</p> <p>B1</p> <p>M1</p> <p>M1 A1 (4)</p> <p style="text-align: right;">(9 marks)</p>
<p>4. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$\log_2(16x) = \log_2 16 + \log_2 x$ $= 4 + a$</p> <p>$\log_2\left(\frac{x^4}{2}\right) = \log_2 x^4 - \log_2 2$ $= 4 \log_2 x - \log_2 2$ $= 4a - 1$ (accept $4 \log_2 x - 1$)</p> <p>$\frac{1}{2} = 4 + a - (4a - 1)$ $a = \frac{3}{2}$</p> <p>$\log_2 x = \frac{3}{2} \Rightarrow x = 2^{\frac{3}{2}}$ $\underline{\underline{x = \sqrt{8} \text{ or } 2\sqrt{2}}}$ or $\sqrt{2^3}$ or $(\sqrt{2})^3$</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 style="text-align: right;">(9 marks)</p>

Question number	Scheme	Marks
<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$\tan x = \frac{8}{3}$ (or exact equivalent, or 3 s.f. or better)</p> <p>$\tan x = \frac{8}{3}$ $x = 69.4^\circ (\alpha)$, $x = 249.4^\circ (180 + \alpha)$</p> <p>$3(1 - \cos^2 y) - 8\cos y = 0$ $3\cos^2 y + 8\cos y - 3 = 0$</p> <p>$(3\cos y - 1)(\cos y + 3) = 0$ $\cos y = \dots$, $\frac{1}{3}$ (or -3)</p> <p>$y = 70.5^\circ (\beta)$, $x = 289.5^\circ (360 - \beta)$</p>	<p>B1 (1)</p> <p>M1 A1, A1ft (3)</p> <p>M1 A1</p> <p>M1 A1</p> <p>A1 A1ft (6)</p> <p>(10 marks)</p>
<p>6. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>$(x^4 - 6x^2 + 9)$</p> <p>$(x^4 - 6x^2 + 9) \div x^3 = x - 6x^{-1} + 9x^{-3}$ (*)</p> <p>$f'(x) = 1 + 6x^{-2} - 27x^{-4}$ First A1: 2 terms correct (unsimplified)</p> <p>Second A1: all 3 correct (simplified)</p> <p>When $x = \pm\sqrt{3}$, $f'(x) = 1 + \frac{6}{(\sqrt{3})^2} - \frac{27}{(\sqrt{3})^4}$</p> <p>$\left(= 1 + \frac{6}{3} - \frac{27}{9}\right) = 0$, \therefore Stationary</p> <p>$f''(x) = -12x^{-3} + 108x^{-5}$ M: Attempt to diff. $f'(x)$, <u>not</u> $g(x)f'(x)$</p> <p>$f''(\sqrt{3}) = -\frac{12}{(\sqrt{3})^3} + \frac{108}{(\sqrt{3})^5}$ $(\approx -2.309 + 6.928 = 4.619)$ $\left(= \frac{8}{\sqrt{3}}\right)$</p> <p>$> 0$, \therefore Minimum (not dependent on a numerical version of $f''(x)$)</p>	<p>M1</p> <p>A1 (2)</p> <p>M1 A1 A1</p> <p>A1 (3)</p> <p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>A1</p> <p>A1ft (3)</p> <p>(10 marks)</p>

Question number	Scheme	Marks
<p>7. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>Solve $\frac{3}{2}x^2 - \frac{1}{4}x^3 = 0$ to find $p = 6$, or verify: $\frac{3}{2} \times 6^2 - \frac{1}{4} \times 6^3 = 0$ (*)</p> <p>$\frac{dy}{dx} = 3x - \frac{3x^2}{4}$</p> <p>$m = -9,$ $y - 0 = -9(x - 6)$ (Any correct form)</p> <p>$3x - \frac{3x^2}{4} = 0,$ $x = 4$</p> <p>$\int \left(\frac{3x^2}{2} - \frac{x^3}{4} \right) dx = \frac{x^3}{2} - \frac{x^4}{16}$ (Allow unsimplified versions)</p> <p>$[\dots\dots\dots]_0^6 = \frac{6^3}{2} - \frac{6^4}{16} = 27$ M: Need 6 and 0 as limits.</p>	<p>B1 (1)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1, A1ft (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p style="text-align: right;">(11 marks)</p>
<p>8. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>$(S =) a + ar + \dots + ar^{n-1}$ “S =” not required. Addition required.</p> <p>$(rS =) ar + ar^2 + \dots + ar^n$ “rS =” not required (M: Multiply by r)</p> <p>$S(1 - r) = a(1 - r^n)$ $S = \frac{a(1 - r^n)}{1 - r}$ (M: Subtract and factorise each side) (*)</p> <p>$r = 0.9$</p> <p>$S_{20} = \frac{10(1 - 0.9^{20})}{1 - 0.9} = 87.8$</p> <p>Sum to infinity $= \frac{a}{1 - r} = \frac{10}{1 - 0.9} = 100$ (ft only for $r < 1$)</p> <p>$\frac{a}{1 - r} = \frac{r}{1 - r} = 10$ (Put $a = r$ in the formula from (c), and equate to 10)</p> <p>$r = 10(1 - r)$ $r = \dots,$ $\frac{10}{11}$ (or exact equivalent)</p>	<p>B1</p> <p>M1</p> <p>M1 A1 (4)</p> <p>B1</p> <p>M1 A1 (3)</p> <p>M1 A1ft (2)</p> <p>M1</p> <p>M1, A1 (3)</p> <p style="text-align: right;">(12 marks)</p>