

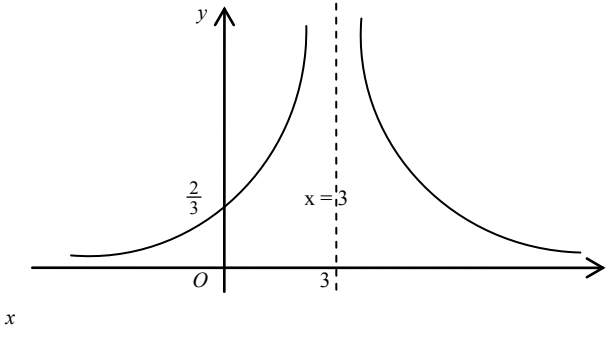
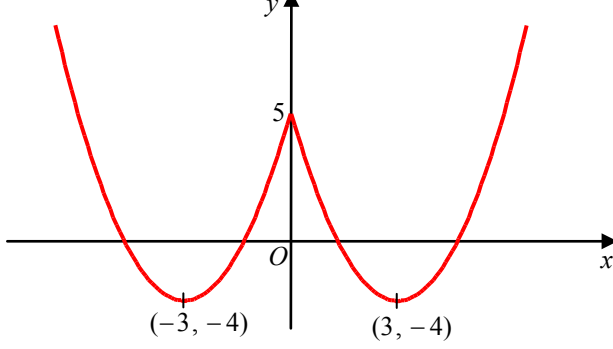
**Edexcel GCE**  
**Core Mathematics C3**  
**Silver Level S2**  
**(Mark Scheme)**

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Mr.S.V.Swarnaraja (Marking Examiner, Team Leader & Author)  
www.swanash.com, Mobile: +94777304755 , email: swa@swanash.com**

Question Number	Scheme	Marks
<p>1. (a)</p>	<p>Iterative formula: <math>x_{n+1} = \frac{2}{(x_n)^2} + 2</math>, <math>x_0 = 2.5</math></p> <p><math>x_1 = \frac{2}{(2.5)^2} + 2</math></p> <p><math>x_1 = 2.32</math>, <math>x_2 = 2.371581451\dots</math></p> <p><math>x_3 = 2.355593575\dots</math>, <math>x_4 = 2.360436923\dots</math></p> <p>(b) Let <math>f(x) = -x^3 + 2x^2 + 2 = 0</math></p> <p><math>f(2.3585) = 0.00583577\dots</math></p> <p><math>f(2.3595) = -0.00142286\dots</math></p> <p>Sign change (and <math>f(x)</math> is continuous) therefore a root <math>\alpha</math> is such that <math>\alpha \in (2.3585, 2.3595) \Rightarrow \alpha = 2.359</math> (3 dp)</p>	<p>M1</p> <p>A1</p> <p>A1 cso (3)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p><b>[6]</b></p>
<p>2. (a)</p>	<p><math>x^3 + 3x^2 + 4x - 12 = 0 \Rightarrow x^3 + 3x^2 = 12 - 4x</math></p> <p><math>\Rightarrow x^2(x + 3) = 12 - 4x</math></p> <p><math>\Rightarrow x^2 = \frac{12 - 4x}{(x + 3)} \Rightarrow x = \sqrt{\frac{4(3 - x)}{(x + 3)}}</math></p> <p>(b) <math>x_1 = 1.41</math>, <i>awrt</i> <math>x_2 = 1.20</math> <math>x_3 = 1.31</math></p> <p>(c) Choosing (1.2715, 1.2725) or tighter containing root 1.271998323</p> <p><math>f(1.2725) = (+)0.00827\dots</math> <math>f(1.2715) = -0.00821\dots</math></p> <p>Change of sign <math>\Rightarrow \alpha = 1.272</math></p>	<p>M1</p> <p>dM1A1* (3)</p> <p>M1A1, A1 (3)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p><b>[9]</b></p>

Question Number	Scheme	Marks
<p><b>3. (a)</b></p> <p>(b)</p> <p>(c)</p>	<p><math>f(0.75) = -0.18\dots</math>  <math>f(0.85) = 0.17\dots</math></p> <p>Change of sign, hence root between <math>x = 0.75</math> and <math>x = 0.85</math></p> <p>Sub <math>x_0 = 0.8</math> into <math>x_{n+1} = \left[ \arcsin(1 - 0.5x_n) \right]^{\frac{1}{2}}</math> to obtain <math>x_1</math></p> <p>Awrt <math>x_1 = 0.80219</math> and <math>x_2 = 0.80133</math></p> <p>Awrt <math>x_3 = 0.80167</math></p> <p><math>f(0.801565) = -2.7\dots \times 10^{-5}</math>  <math>f(0.801575) = +8.6\dots \times 10^{-6}</math></p> <p>Change of sign and conclusion</p>	<p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>M1 A1</p> <p>A1 (3)</p> <p><b>[8]</b></p>
<p><b>4.</b></p> <p>(a)</p> <p>(b)</p> <p>(c)</p>	<p><math>f(2) = 0.38 \dots</math>  <math>f(3) = -0.39 \dots</math></p> <p>Change of sign (and continuity) <math>\Rightarrow</math> root in <math>(2, 3)</math> *</p> <p><math>x_1 = \ln 4.5 + 1 \approx 2.50408</math>  <math>x_2 \approx 2.50498</math>  <math>x_3 \approx 2.50518</math></p> <p>Selecting <math>[2.5045, 2.5055]</math>, or appropriate tighter range, and evaluating at both ends.  <math>f(2.5045) \approx 6 \times 10^{-4}</math>  <math>f(2.5055) \approx -2 \times 10^{-4}</math></p> <p>Change of sign (and continuity) <math>\Rightarrow</math> root <math>\in (2.5045, 2.5055)</math>  <math>\Rightarrow</math> root = 2.505 to 3 dp *</p>	<p>M1</p> <p>A1 (2) cso</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>M1</p> <p>A1 (2) cso</p> <p><b>[7]</b></p>

Question Number	Scheme	Marks
5. (a)	$x^2 - 2x - 3 = (x-3)(x+1)$ $f(x) = \frac{2(x-1) - (x+1)}{(x-3)(x+1)} \left( \text{or } \frac{2(x-1)}{(x-3)(x+1)} - \frac{x+1}{(x-3)(x+1)} \right)$ $= \frac{x-3}{(x-3)(x+1)} = \frac{1}{x+1} *$	B1 M1 A1 A1 cso (4)
(b)	$\left(0, \frac{1}{4}\right)$ Accept $0 < y < \frac{1}{4}$ , $0 < f(x) < \frac{1}{4}$ etc.	B1 B1 (2)
(c)	Let $y = f(x)$ $y = \frac{1}{x+1}$ $x = \frac{1}{y+1}$ $yx + x = 1$ $y = \frac{1-x}{x}$ or $\frac{1}{x} - 1$ $f^{-1}(x) = \frac{1-x}{x}$ Domain of $f^{-1}$ is $\left(0, \frac{1}{4}\right)$	M1 A1 B1 ft (3)
(d)	$fg(x) = \frac{1}{2x^2 - 3 + 1}$ $\frac{1}{2x^2 - 2} = \frac{1}{8}$ $x^2 = 5$ $x = \pm\sqrt{5}$	M1 A1 both A1 (3) [12]

Question Number	Scheme	Marks
6. (a)	Finding $g(4) = k$ and $f(k) = \dots$ or $fg(x) = \ln\left(\frac{4}{x-3} - 1\right)$ $[f(2) = \ln(2 \times 2 - 1) \quad fg(4) = \ln(4 - 1)] = \ln 3$	M1 A1 (2)
(b)	$y = \ln(2x - 1) \Rightarrow e^y = 2x - 1$ or $e^x = 2y - 1$ $f^{-1}(x) = \frac{1}{2}(e^x + 1)$ Allow $y = \frac{1}{2}(e^x + 1)$ Domain $x \in \mathfrak{R}$ [Allow $\mathfrak{R}$ , all reals, $(-\infty, \infty)$ ] independent	M1, A1 A1 B1 (4)
(c)		Shape, and $x$ -axis should appear to be asymptote <b>Equation <math>x = 3</math> needed</b> , may see in diagram (ignore others) Intercept $(0, \frac{2}{3})$ no other; accept $y = \frac{2}{3}$ (0.67) or on graph
(d)	$\frac{2}{x-3} = 3 \Rightarrow x = 3\frac{2}{3}$ or exact equiv. $\frac{2}{x-3} = -3, \Rightarrow x = 2\frac{1}{3}$ or exact equiv.	B1 M1, A1 (3) <b>[12]</b>
7. (a)(i)	(3, 4)	B1 B1
(ii)	(6, -8)	B1 B1 (4)
(b)		B1 B1 B1 (3)
(c)	$f(x) = (x - 3)^2 - 4$ or $f(x) = x^2 - 6x + 5$	M1A1 (2)
(d)	Either: The function $f$ is a many-one {mapping}. Or: The function $f$ is not a one-one {mapping}.	B1 (1) <b>[10]</b>

Question Number	Scheme	Marks
8. (a)	(i) $\frac{d}{dx}(\ln(3x)) = \frac{3}{3x}$ $\frac{d}{dx}(x^{\frac{1}{2}} \ln(3x)) = \ln(3x) \times \frac{1}{2} x^{-\frac{1}{2}} + x^{\frac{1}{2}} \times \frac{3}{3x}$	M1 M1A1 (3)
	(ii) $\frac{dy}{dx} = \frac{(2x-1)^5 \times -10 - (1-10x) \times 5(2x-1)^4 \times 2}{(2x-1)^{10}}$ $\frac{dy}{dx} = \frac{80x}{(2x-1)^6}$	M1A1 A1 (3)
(b)	$x = 3 \tan 2y \Rightarrow \frac{dx}{dy} = 6 \sec^2 2y$ $\Rightarrow \frac{dy}{dx} = \frac{1}{6 \sec^2 2y}$ <p>Uses <math>\sec^2 2y = 1 + \tan^2 2y</math> and uses <math>\tan 2y = \frac{x}{3}</math></p> $\Rightarrow \frac{dy}{dx} = \frac{1}{6(1+(\frac{x}{3})^2)} = \left(\frac{3}{18+2x^2}\right)$	M1A1 M1 M1A1 (5) [11]

## Statistics for C3 Practice Paper Silver Level S2

Qu	Max score	Modal score	Mean %	Mean score for students achieving grade:							
				ALL	A*	A	B	C	D	E	U
1	6		77	4.63		5.42	4.87	4.30	3.77	3.19	2.36
2	9		86	7.77	8.87	8.60	8.21	7.64	6.88	5.84	4.13
3	8		78	6.23	7.80	7.36	6.81	5.94	4.95	3.66	1.96
4	7		78	5.48		6.05	5.34	4.82	4.13	3.45	2.53
5	12		72	8.61		9.96	8.98	8.23	7.35	5.94	3.94
6	12		69	8.24		10.40	8.65	7.42	5.93	4.39	2.51
7	10		67	6.67	9.12	7.93	6.76	5.82	4.95	4.07	2.73
8	11		70	7.67	10.33	9.10	8.04	7.00	5.80	4.48	2.50
	<b>75</b>		<b>74</b>	<b>55.30</b>		<b>64.82</b>	<b>57.66</b>	<b>51.17</b>	<b>43.76</b>	<b>35.02</b>	<b>22.66</b>