Question Number	Scheme	Marks
10 (a)	$f(2) = 2\times 2^3 - p\times 2^2 - 13\times 2 - q = -20 \quad (\Rightarrow 10 = 4p + q)$ $f(3) = 2\times 3^3 - p\times 3^2 - 13\times 3 - q = 0 \quad (\Rightarrow 15 = 9p + q)$ Solves simultaneous equations by elimination or substitution; $\Rightarrow 5 = 5p \Rightarrow p = 1,$ so $q = 6$	M1A1 M1A1 M1 A1 A1 (7)
(b)	$(2x^3 - x^2 - 13x - 6) \div (x - 3) = 2x^2 + 5x + 2$ $(2x^3 - x^2 - 13x - 6) = (x - 3)(2x + 1)(x + 2)$ (Factorises $2x^2 + 5x + 2$) $x = 3, -\frac{1}{2}, -2$ (all three roots)	M1A1 M1 A1A1 (5) **(12)**

(a)

M1 Substitute ± 2 in f(x)

A1 Correct equation using remainder -20 Need not be simplified

M1 Substitute ± 3 in f(x)

A1 Correct equation using remainder 0 Need not be simplified

First 4 marks can be given for long division:

Divide by $(x \pm 2)$ M1 Equate correct remainder to - 20 A1

Divide by $(x \pm 3)$ M1 Equate correct remainder to 0 A1

M1 Solve the simultaneous equations, any valid method

A1 p or q correct

A1 Second unknown correct

(b)

M1 Obtain the quadratic factor by division or inspection. Factor need not be fully correct but must be of form $2x^2 + kx \pm \frac{\text{their } q}{3}$ If by division, remainder need not be 0.

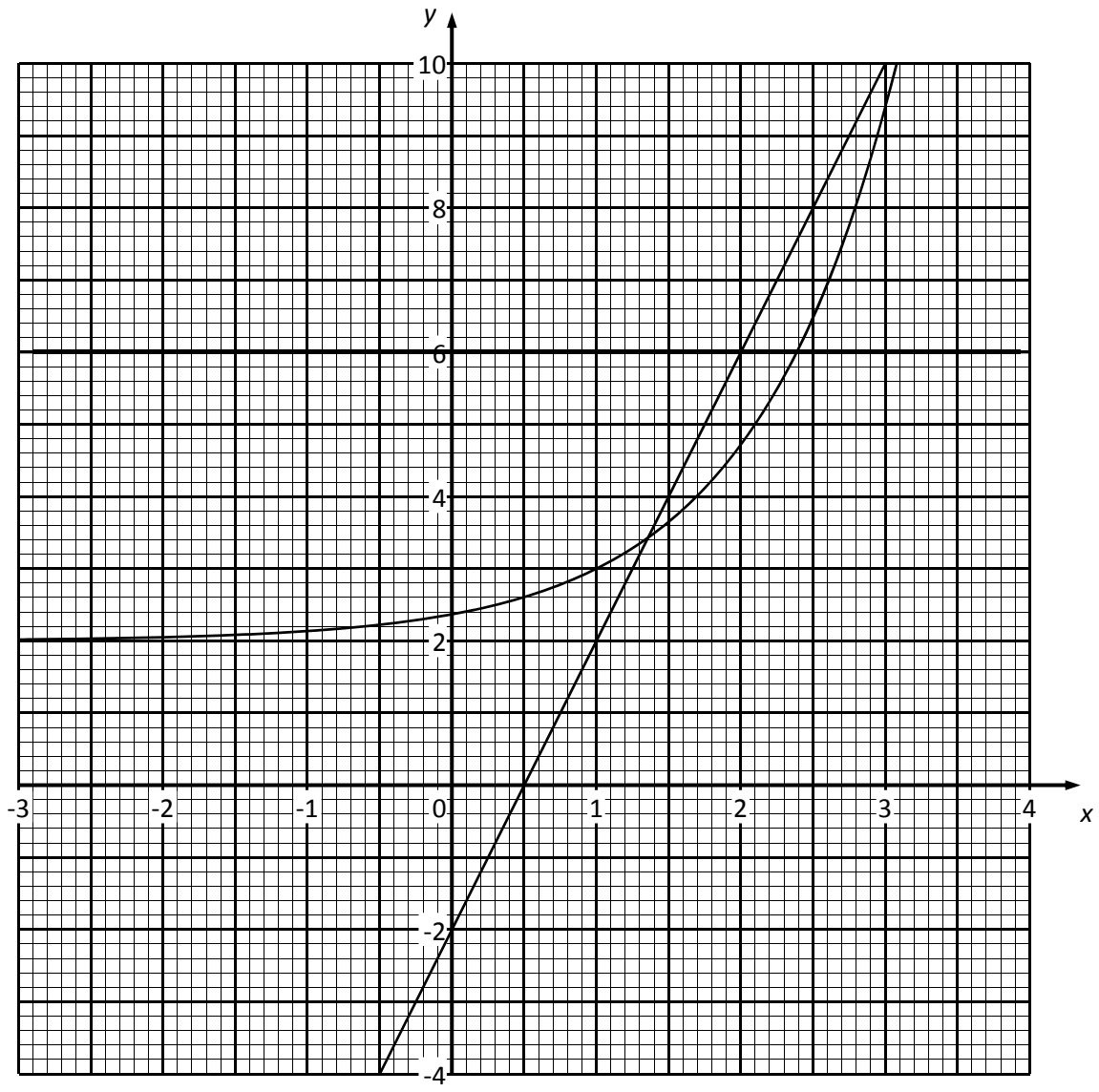
A1 Correct quadratic factor

M1 Attempt to factorise their quadratic factor

A1A1 A1A1 all three roots correct; A1A0 two roots correct

Question Number	Scheme	Marks
11(a)	x | -2 | -1 | 0 | 1 | 2 | 3 f(x) | 2.05 | **2.14** | **2.37** | **3** | 4.72 | 9.39	B1B1 (2)
(b)	Correct points plotted and graph drawn	B1ftB1ft (2)
(c)	$4 = e^{(x-1)} \Rightarrow 6 = e^{(x-1)} + 2 \quad y = 6$ Line $y = 6$ drawn $\Rightarrow x = 2.4$	M1 A1 (2)
(d)	$\ln(4x-4) = x-1 \Rightarrow (4x-4) = e^{(x-1)}$, $\Rightarrow 4x-2 = e^{(x-1)} + 2$ $y = 4x-2$ drawn on graph accept x = 1.3/1.4	M1,A1 A1ft dM1 A1cso(5) **(11)**

(a) B1B1	NB Read rounding rules at start of this document B1B1 three correct values; B1B0 two correct values
(b) B1ft B1ft	Plot their points correctly Draw a smooth curve through their points. $-2 \leqslant x \leqslant 3$ only needed - ignore any points/graph outside this range.
(c) M1	Attempt to deduce the value of y corresponding to the given equation, $y = 4 \pm 2$ should be seen
A1	Using $y = 6$ to obtain $x = 2.4$ Must be 1 dp unless already penalised (2.3862...) If the M mark is gained and $y = 6$ or $e^{(x-1)} + 2 = 6$ is seen this mark can be given without the line being drawn. If the line $y = 6$ is seen on the graph and correct answer given, award M1A1
(d) M1 A1 A1ft dM1 A1cso	Change equation from log to exponential form Correct exponential equation Add 2 to each side of their equation Draw their line on their graph Obtain $x = 1.3$ or 1.4 Must be 1 dp unless already penalised (1.355...) Correct answers from incorrect lines score A0. Ignore extra answers outside the given range.


y
10
8
6
4
2
-2
-4
-3
-2
-1
0
1
2
3
4
x

Question Number	Scheme	Marks
12(a)	$BM = \sqrt{8^2 - 4^2}, = 4\sqrt{3}$ $\left(\text{oe eg } \sqrt{24} \times \sqrt{2}\right)$	M1,A1A1 (3)
	$p = 4 \qquad q = 3$	
(b)	$\cos BAM = \frac{4}{8} \Rightarrow BAM = 60^o$	M1A1 (2)
(c)	$EM = \sqrt{12^2 + 20^2} \quad \left(= \sqrt{544} = 4\sqrt{34}\right)$	M1A1
	$MEB = \tan^{-1}\left(\frac{4\sqrt{3}}{4\sqrt{34}}\right) = 16.5437..... \Rightarrow MEB = 16.5^o$	dM1A1(4)
(d)	Angle between plane *BCEH* and *ADEH* =	M1
	$\tan^{-1}\left[\frac{4\sqrt{3}}{20}\right] = 19.1066... = 19.1^o$	dM1A1 (3)
		(12)

(a)

M1 Use Pythagoras Must have minus sign

A1 A1A1 for correct p and q equivalent values allowed as long as one is prime.

A1 A1A0 for one correct. Values need not be shown explicitly.

(b)

M1 Use any trig function correctly (eg $\sin = \frac{\text{opp}}{\text{hyp}}$)to find $\angle BAM$ If cos or tan used then *AM* must = 4 or working for length *AM* must be seen. Their *BM* if used

A1 Correct answer. 60^o without working scores M1A1

(c)

M1 Use Pythagoras to find length *EM*. Must have + sign. If *BE* found without first finding *EM* this mark requires a complete method.
Award M1 for $EM^2 = 16^2 + 20^2$ provided this is stated to be *EM* or implied by subsequent working.

A1 Correct length *EM* (need not be simplified) (or *BE* =24.33....)

dM1 Use any trig function correctly with their values to find $\angle MEB$

A1 Correct answer. Must be to nearest 0.1^o

(d)

M1 Identify the required angle. Can be stated explicitly or implied by subsequent working.

dM1 Use any trig function correctly to obtain the size of a correct angle

A1 Correct answer. Must be to nearest 0.1^ounless already penalised.