

Year 12 EOY Paper 2

1

- (a) evidence of choosing cosine rule *(M1)*
e.g. $a^2 + b^2 - 2ab \cos C$

correct substitution *A1*
e.g. $7^2 + 9^2 - 2(7)(9)\cos 120^\circ$
 $AC = 13.9 \quad (= \sqrt{193})$ *A1 N2*
[3 marks]

- (b) **METHOD 1**
evidence of choosing sine rule *(M1)*
e.g. $\frac{\sin A}{BC} = \frac{\sin B}{AC}$

correct substitution *A1*
e.g. $\frac{\sin A}{9} = \frac{\sin 120}{13.9}$
 $\hat{A} = 34.1^\circ$ *A1 N2*
[3 marks]

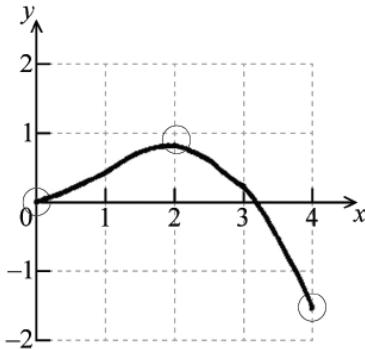
METHOD 2

- evidence of choosing cosine rule *(M1)*
e.g. $\cos A = \frac{AB^2 + AC^2 - BC^2}{2(AB)(AC)}$

correct substitution *A1*
e.g. $\cos A = \frac{7^2 + 13.9^2 - 9^2}{2(7)(13.9)}$
 $\hat{A} = 34.1^\circ$ *A1 N2*
[3 marks]

Total [6 marks]

(a)

*A1 A1 A1 A1 N4*

Note: Award *A1* for approximately correct shape, *A1* for left end point in circle,
A1 for local maximum in circle, *A1* for right end point in circle.

[4 marks]

- (b) attempting to solve
- $g(x) = -1$

(M1)

e.g. marking coordinate on graph, $\frac{1}{2}x \sin x + 1 = 0$

$$x = 3.71$$

*A1 N2
[2 marks]**Total [6 marks]*

- (a) correct substitution

(A1)

e.g. $8.5 = \theta(6.8)$, $\theta = \frac{8.5}{6.8}$

$$\theta = 1.25 \text{ (accept } 71.6^\circ\text{)}$$

*A1 N2
[2 marks]*

- (b)
- METHOD 1**

correct substitution into area formula (seen anywhere)

(A1)

e.g. $A = \pi(6.8)^2$, 145.267...

correct substitution into area formula (seen anywhere)

(A1)

e.g. $A = \frac{1}{2}(1.25)(6.8^2)$, 28.9

valid approach

M1

e.g. $\pi(6.8)^2 - \frac{1}{2}(1.25)(6.8^2)$; 145.267... - 28.9; $\pi r^2 - \frac{1}{2}r^2 \sin \theta$

$$A = 116 \text{ (cm}^2\text{)}$$

*A1 N2
[4 marks]*

METHOD 2

attempt to find reflex angle
e.g. $2\pi - \theta$, $360^\circ - 1.25$

(M1)

correct reflex angle

(AI)

$$\hat{A}OB = 2\pi - 1.25 \quad (= 5.03318\dots)$$

correct substitution into area formula

AI

e.g. $A = \frac{1}{2}(5.03318\dots)(6.8^2)$

$$A = 116 \text{ (cm}^2\text{)}$$

AI

N2

[4 marks]

Total [6 marks]

4

(a) 10 terms

AI

NI

[1 mark]

(b) evidence of binomial expansion

(M1)

e.g. $a^9b^0 + \binom{9}{1}a^8b + \binom{9}{2}a^7b^2 + \dots, \binom{9}{r}(a)^{9-r}(b)^r$, Pascal's triangle

evidence of correct term

(AI)

e.g. 8th term, $r = 7$, $\binom{9}{7}$, $(3x^2)^2 2^7$

correct expression of complete term

(AI)

e.g. $\binom{9}{7}(3x^2)^2(2)^7$, ${}_2C(3x^2)^2(2)^7$, $36 \times 9 \times 128$

$$41472 x^4 \quad (\text{accept } 41500 x^4)$$

AI

N2

[4 marks]

Total [5 marks]

5

- (a) valid approach *R1*
e.g. $f''(x) = 0$, the max and min of f' gives the points of inflection on f
- 0.114, 0.364 (accept (–0.114, 0.811) and (0.364, 2.13)) *A1A1 N1N1*
- (b) **METHOD 1**
graph of g is a quadratic function *R1 N1*
a quadratic function does not have any points of inflection *R1 N1*
- METHOD 2**
graph of g is concave down over entire domain *R1 N1*
therefore no change in concavity *R1 N1*
- METHOD 3**
 $g''(x) = -144$ *R1 N1*
therefore no points of inflection as $g''(x) \neq 0$ *R1 N1*
- [5 marks]*

6

- (a) (i) correct approach *(AI)*
- e.g.* $u_4 = (40) \frac{1}{2}^{(4-1)}$, listing terms *A1 N2*
- $u_4 = 5$ *A1 N2*
- (ii) correct substitution into formula for infinite sum *(AI)*
e.g. $S_{\infty} = \frac{40}{1-0.5}$, $S_{\infty} = \frac{40}{0.5}$
- $S_{\infty} = 80$ *A1 N2*
[4 marks]
- (b) (i) attempt to set up expression for u_8 *(M1)*
e.g. $-36 + (8-1)d$
- correct working *A1*
e.g. $-8 = -36 + (8-1)d$, $\frac{-8 - (-36)}{7}$
- $d = 4$ *A1 N2*

- (ii) correct substitution into formula for sum *(AI)*

$$\text{e.g. } S_n = \frac{n}{2}(2(-36) + (n-1)4)$$

correct working

AI

$$\text{e.g. } S_n = \frac{n}{2}(4n - 76), -36n + 2n^2 - 2n$$

$$S_n = 2n^2 - 38n$$

AG *N0*
[5 marks]

- (c) multiplying S_n (AP) by 2 or dividing S (infinite GP) by 2 *(M1)*

$$\text{e.g. } 2S_n, \frac{S_\infty}{2}, 40$$

evidence of substituting into $2S_n = S_\infty$

AI

$$\text{e.g. } 2n^2 - 38n = 40, 4n^2 - 76n - 80 (= 0)$$

attempt to solve **their** quadratic (equation) *(M1)*

e.g. intersection of graphs, formula

$$n = 20$$

A2 *N3*
[5 marks]

Total [14 marks]

7

- (a) combining 2 terms *(A1)*

$$\text{e.g. } \log_3 8x - \log_3 4, \log_3 \frac{1}{2}x + \log_3 4$$

expression which clearly leads to answer given

AI

$$\text{e.g. } \log_3 \frac{8x}{4}, \log_3 \frac{4x}{2}$$

$$f(x) = \log_3 2x$$

AG *N0*
[2 marks]

- (b) attempt to substitute either value into f *(M1)*

$$\text{e.g. } \log_3 1, \log_3 9$$

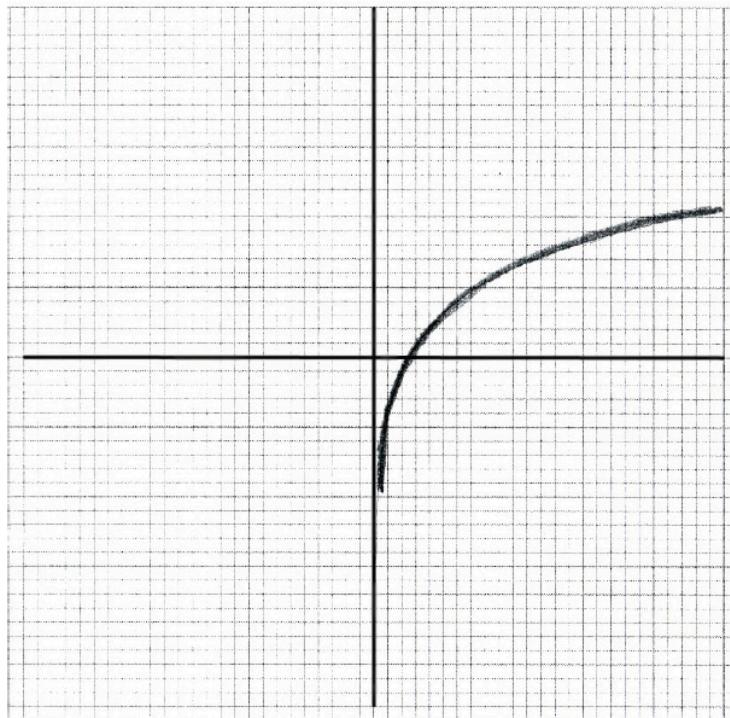
$$f(0.5) = 0, f(4.5) = 2$$

A1A1 *N3*
[3 marks]

(c) (i) $a = 2, b = 3$

A1A1 N1N1

(ii)



A1A1A1 N3

Note: Award A1 for sketch approximately through $(0.5 \pm 0.1, 0 \pm 0.1)$,

A1 for approximately correct shape,

A1 for sketch asymptotic to the y-axis.

(iii) $x = 0$ (must be an equation)

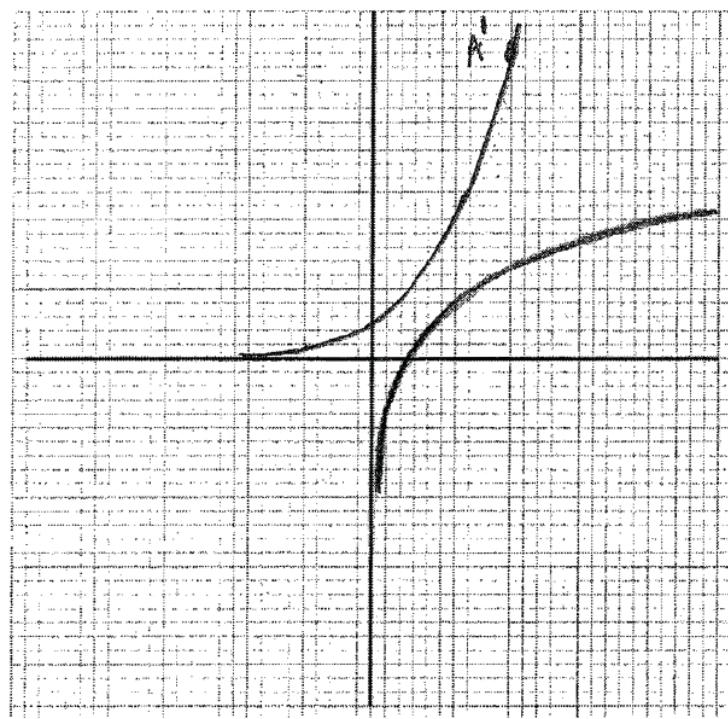
A1 N1
[6 marks]

(d) $f^{-1}(0) = 0.5$

A1 N1

[1 mark]

(e)



A1 A1 A1 A1 A1 N4

Note: Award A1 for sketch approximately through $(0 \pm 0.1), 0.5 \pm 0.1$,

A1 for approximately correct shape of the graph reflected over $y = x$,

A1 for sketch asymptotic to x -axis,

A1 for point $(2 \pm 0.1, 4.5 \pm 0.1)$ clearly marked and on curve.

[4 marks]

Total [16 marks]