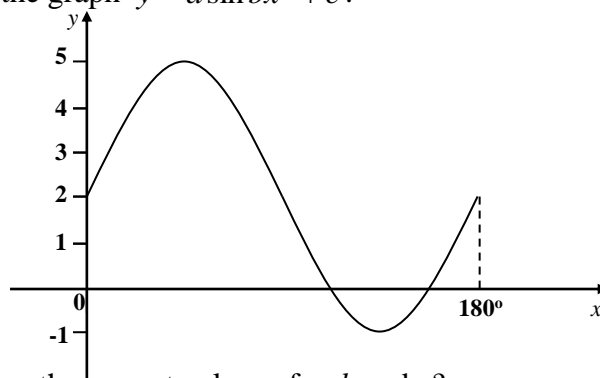


TEST C

1. The equation of a line is $3y + 4x = 12$. The gradient of a line perpendicular to it is
- A. $-\frac{4}{3}$
- B. $-\frac{3}{4}$
- C. $\frac{3}{4}$
- D. $\frac{1}{4}$
2. Two functions, f and g , are defined on suitable domains as $f(x) = \frac{2}{x}$ and $g(x) = x^2 + 3$. The value of $g(f(\frac{1}{2}))$ is
- A. 19
- B. 4
- C. 0.5
- D. 7
3. The gradient of the tangent to the curve $y = 2x^3 + 3x$ at the point (2, 3) is
- A. 22
- B. 27
- C. 57
- D. 63
4. The diagram shows part of the graph $y = a \sin bx^\circ + c$.



Which line of the table shows the correct values of a , b and c ?

	a	b	c
A.	2	3	2
B.	5	2	2
C.	3	1	2
D.	3	2	2

5. For the recurrence relation $U_{n+1} = 1 \cdot 5U_n - b$ with $U_1 = 26$ and $U_2 = 35$, the value of U_0 is
- A. 20
 B. 17
 C. 4
 D. 35

6. $\frac{d}{dx} \sin(3x-1)$ is equal to
- A. $\frac{1}{3} \cos(3x-1)$
 B. $3 \cos(3x-1)$
 C. $-\frac{1}{3} \cos(3x-1)$
 D. $-3 \cos(3x-1)$

7. If $f(x) = (4x + x^2)^3$ is, the value of $f'(1)$ is
- A. $41\frac{2}{3}$
 B. 75
 C. 450
 D. 1875

8. Two functions are defined on suitable domains and are given as

$$f(x) = 3x - \frac{1}{x} \quad \text{and} \quad g(x) = x^2 + 6.$$

Show clearly that $g(f(x)) = 9x^2 + \frac{1}{x^2}$.

3

9. Triangle ABC has vertices A(9, 8), B(-8, 0) and C(10, -8)

- (a) Show clearly that the equation of the median through A is

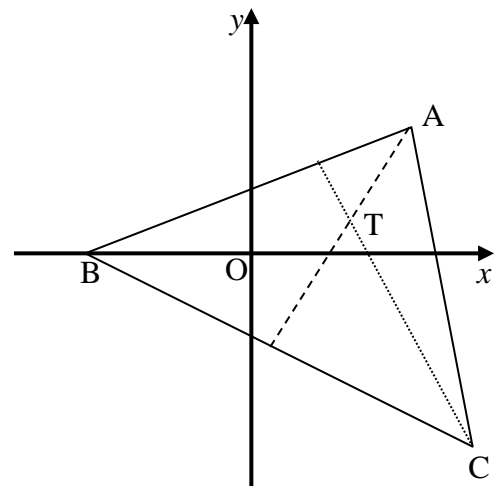
$$2y - 3x + 11 = 0$$

4

- (b) The line through C with gradient -2 meets the median through A at the point T.

Establish the coordinates of T.

4



10. Given that $g(x) = x^{-2}(x^3 - \frac{1}{x^2})$, find $g'(x)$. 4

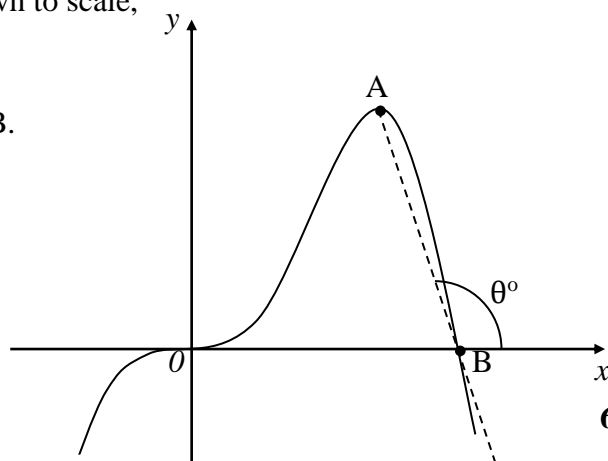
11. A recurrence relation is defined as $U_{n+1} = 0.6U_n + 12$, with $U_0 = 200$.

(a) Find the limit (L) of the sequence generated by this recurrence relation. 1

(b) Find the smallest value of n such that $U_n - L \leq 40$ 3

12. The curve shown in the diagram, which is not drawn to scale, has equation $y = 8x^3 - 2x^4$.

It has a turning point at A and cuts the x -axis at B.



(a) Find the coordinates of the points A and B. 6

(b) The line joining A and B makes an angle of θ° with the positive direction of the x -axis.

Calculate the value of θ correct to the nearest degree. 3

SET D

Marking Scheme - UNIT 1

	Give 1 mark for each •	Illustration(s) for awarding each mark
1	C	<p style="text-align: center;">Award 2 marks for each correct answer</p> <p style="text-align: center;">14 marks</p>
2	A	
3	B	
4	D	
5	A	
6	B	
7	C	
8(a)	ans: proof (3 marks)	
	<ul style="list-style-type: none"> •¹ knows to substitute •² squares bracket correctly •³ simplifies to required form 	<ul style="list-style-type: none"> •¹ $(3x - \frac{1}{x})^2 + 6$ •² $9x^2 - 6 + \frac{1}{x^2} + 6$ •³ $= 9x^2 + \frac{1}{x^2}$
9(a)	ans: proof (4 marks)	
	<ul style="list-style-type: none"> •¹ finds midpoint of BC •² finds gradient •³ substitutes into $y - b = m(x - a)$ •⁴ rearranges to required form 	<ul style="list-style-type: none"> •¹ (1, -4) •² $m = \frac{8+4}{9-1} = \frac{12}{8} = \frac{3}{2}$ •³ $y - 8 = \frac{3}{2}(x - 9)$ or $y + 4 = \frac{3}{2}(x - 1)$ •⁴ $2y - 16 = 3x - 27; 2y - 3x + 11 = 0$
(b)	ans: T(5, 2) (4 marks)	
	<ul style="list-style-type: none"> •¹ establishes equation of second line •² knows to use simultaneous equations •³ solves for x and y •⁴ states coordinates of T 	<ul style="list-style-type: none"> •¹ $y + 2x = 12$ •² evidence •³ $x = 5; y = 2$ •⁴ T(5, 2)
10	ans: $1 + 4x^{-5}$ (4 marks)	
	<ul style="list-style-type: none"> •¹ brings power up •² prepares to differentiate •³ differentiates first term •⁴ differentiates second term 	<ul style="list-style-type: none"> •¹ $x^{-2}(x^3 - x^{-2})$ •² $x - x^{-4}$ •³ 1..... •⁴ + $4x^{-5}$ <p>Note: mark 4 can only be awarded when differentiating a negative power.</p>

	Give 1 mark for each •	Illustration(s) for awarding each mark
11(a)	ans: 30 (1 mark) • ¹ finds limit	• ¹ $L = \frac{12}{1-0.6} = \frac{12}{0.4} = 30$
(b)	ans: $n = 3$ (3 marks) • ¹ knows to find subsequent terms • ² continues sequence • ³ states smallest value of n	• ¹ $U_1 = 0.6 \times 200 + 12 = 132; 132 - 30 = 102$ • ² $U_2 = 91 \cdot 2(61 \cdot 2); U_3 = 66 \cdot 72(36 \cdot 72)$ • ³ $n = 3$
12(a)	ans: A(3, 54); B(4, 0) (6 marks) • ¹ knows to differentiate • ² equates derivative to 0 • ³ solves for x • ⁴ finds y coordinate • ⁵ makes equation equal to 0 • ⁶ solves to find B	• ¹ $\frac{dy}{dx} = 24x^2 - 8x^3$ • ² $24x^2 - 8x^3 = 0$ • ³ $8x^2(3-x) = 0; x = 3$ • ⁴ $y = 8(3)^3 - 2(3)^4 = 216 - 162 = 54$ A(3, 54) • ⁵ $8x^3 - 2x^4 = 0$ • ⁶ $2x^3(4-x) = 0; x = 4; B(4, 0)$
(b)	ans: 91° (3 marks) • ¹ finds gradient of AB • ² knows to take \tan^{-1} • ³ answer correctly rounded	• ¹ $m_{AB} = \frac{54-0}{3-4} = -54$ • ² $\tan^{-1} = \dots\dots$ • ³ 91°
		Total: 42 marks