Pure Year 1 exam questions Edexcel

Arancha Ruiz

Ch. 13: Integration

June 2023 Question 16

16. A curve has equation $y = f(x), \; x \geqslant 0$

Given that

- $f'(x) = 4x + a\sqrt{x} + b$, where a and b are constants
- the curve has a stationary point at $(4, 3)$
- the curve meets the y-axis at -5

find $f(x)$, giving your answer in simplest form.

(6)

ANSWER

Question	Scheme	Marks	AOs
16	Sets $f'(4) = 0 \Rightarrow 16 + 2a + b = 0$	M1	2.1
	Integrates $f'(x) = 4x + a\sqrt{x} + b \Rightarrow \{f(x) =\} 2x^2 + \frac{2}{3}ax^{\frac{3}{2}} + bx \; \{+c\}$	M1 A1ft	1.1b 1.1b
	Deduces that $c = -5$	B1	2.2a
	Full and complete method using the given information $f'(4) = 0$ and $f(4) = 3$ in order to find values for a and b Note: $a = -15$ and $b = 14$	ddM1	3.1a
	$\{f(x) =\} 2x^2 - 10x^{\frac{3}{2}} + 14x - 5$	A1	1.1b
		(6)	
		(6 marks)	

June 2023 Question 5

5. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

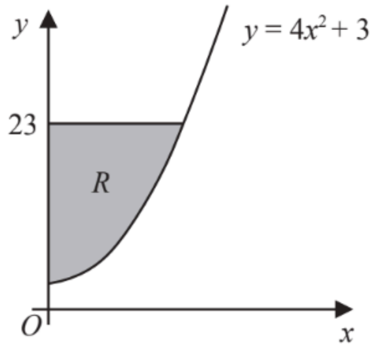


Figure 2

The finite region R, shown shaded in Figure 2, is bounded by the curve with equation $y = 4x^2 + 3$, the y-axis and the line with equation $y = 23$

Show that the exact area of R is $k\sqrt{5}$ where k is a rational constant to be found.

(5)

ANSWER

Question	Scheme	Marks	AOs
5	States or uses the upper limit is $\sqrt{5}$	B1	1.1b
	$$\int 4x^2+3\,\mathrm{d}x=\frac{4}{3}x^3+3x$$	M1 A1	1.1b 1.1b
	Full method of finding the area of R e.g. $23\sqrt{5}-\left[\frac{4}{3}x^3+3x\right]_0^{\sqrt{5}}=\ldots$ e.g. $\left[20x-\frac{4}{3}x^3\right]_0^{\sqrt{5}}=\ldots$	M1	2.1
	$\Rightarrow$ Area $R=\dfrac{40}{3}\sqrt{5}$	A1	1.1b
		(5)	
			(5 marks)

June 2023 Question 5 Paper 2 (A-Level)

5. The curve C has equation $y = f(x)$

The curve

- passes through the point $P(3, -10)$
- has a turning point at P

Given that

$$\frac{dy}{dx} = 2x^3 - 9x^2 + 5x + k$$

where k is a constant,

(a) show that $k = 12$

(2)

(b) Hence find the coordinates of the point where C crosses the y-axis.

(3)

ANSWER

Question	Scheme	Marks	AOs
5(a)	$2(3)^3 - 9(3)^2 + 5(3) + k = 0 \Rightarrow k = \dots$	**M1**	1.1b
	$54 - 81 + 15 + k = 0 \Rightarrow k = 12*$ or $-12 + k = 0 \Rightarrow k = 12*$	**A1***	1.1b
		(2)	
	(a) Alternative by verification:		
	$2(3)^3 - 9(3)^2 + 5(3) + 12 = 0$	**M1**	1.1b
	$54 - 81 + 15 + 12 = 0$ Hence $k = 12$ *	**A1***	1.1b
		(2)	
(b)	$\int(2x^3 - 9x^2 + 5x + 12)\,dx \dots x^4 \pm \dots x^3 \pm \dots x^2 \pm \dots x \pm \dots$	**M1**	3.1a
	$\frac{1}{2}(3)^4 - 3(3)^3 + \frac{5}{2}(3)^2 + 12(3) + c = -10 \Rightarrow c = \dots$	**dM1**	1.1b
	$(0, -28)$	**A1**	2.2a
		(3)	
			(5 marks)

June 2023 Question 1 Paper 1 (A-Level)

1. Find

$$\int \frac{x^{\frac{1}{2}}(2x-5)}{3}\,dx$$

writing each term in simplest form.

(4)

ANSWER

Question	Scheme	Marks	AOs
1	$x^{\frac{1}{2}}(2x-5) = \ldots x^{\frac{3}{2}} + \ldots x^{\frac{1}{2}}$ or $\frac{x^{\frac{1}{2}}(2x-5)}{3} = \frac{\ldots x^{\frac{3}{2}} + \ldots x^{\frac{1}{2}}}{3}$	M1	1.1b
	$\frac{2x^{\frac{3}{2}}}{3} - \frac{5x^{\frac{1}{2}}}{3}$	A1	1.1b
	$\int \frac{2x^{\frac{3}{2}}}{3} - \frac{5x^{\frac{1}{2}}}{3}\,dx = \ldots x^{\frac{5}{2}} \pm \ldots x^{\frac{3}{2}}\ (+c)$	dM1	1.1b
	$\frac{4}{15}x^{\frac{5}{2}} - \frac{10}{9}x^{\frac{3}{2}} + c$	A1	1.1b
		(4)	
			(4 marks)

June 2022 Question 8 Paper 2 (A Level)

8. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

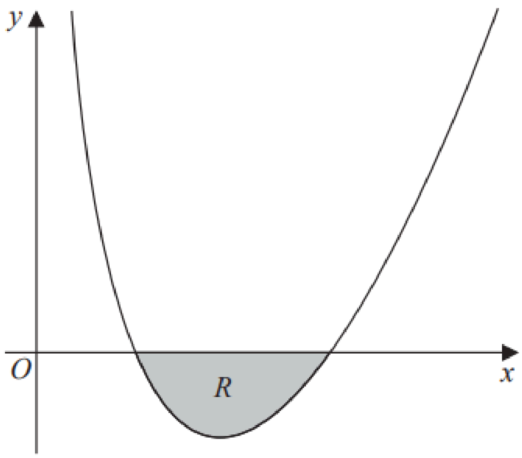


Figure 3

Figure 3 shows a sketch of part of a curve with equation

$$y = \frac{(x-2)(x-4)}{4\sqrt{x}} \qquad x > 0$$

The region R, shown shaded in Figure 3, is bounded by the curve and the x-axis.

Find the exact area of R, writing your answer in the form $a\sqrt{2} + b$, where a and b are constants to be found.

(6)

ANSWER

Question	Scheme	Marks	AOs
8	$y=\dfrac{(x-2)(x-4)}{4\sqrt{x}}=\dfrac{x^2-6x+8}{4\sqrt{x}}=\dfrac{1}{4}x^{\frac{3}{2}}-\dfrac{3}{2}x^{\frac{1}{2}}+2x^{-\frac{1}{2}}$	M1 A1	1.1b 1.1b
	$\displaystyle\int \frac{1}{4}x^{\frac{3}{2}}-\frac{3}{2}x^{\frac{1}{2}}+2x^{-\frac{1}{2}}\,\mathrm{d}x=\frac{1}{10}x^{\frac{5}{2}}-x^{\frac{3}{2}}+4x^{\frac{1}{2}}\,(+c)$	dM1 A1	3.1a 1.1b
	Deduces limits of integral are 2 and 4 and applies to their $\dfrac{1}{10}x^{\frac{5}{2}}-x^{\frac{3}{2}}+4x^{\frac{1}{2}}$	M1	2.2a
	$\left(\dfrac{32}{10}-8+8\right)-\left(\dfrac{2}{5}\sqrt{2}-2\sqrt{2}+4\sqrt{2}\right)=\dfrac{16}{5}-\dfrac{12}{5}\sqrt{2}$ Area R $=\dfrac{12}{5}\sqrt{2}-\dfrac{16}{5}$ $\left(\text{or } \dfrac{16}{5}-\dfrac{12}{5}\sqrt{2}\right)$	A1	2.1
		(6)	
			(6 marks)

June 2022 Question 10

10.

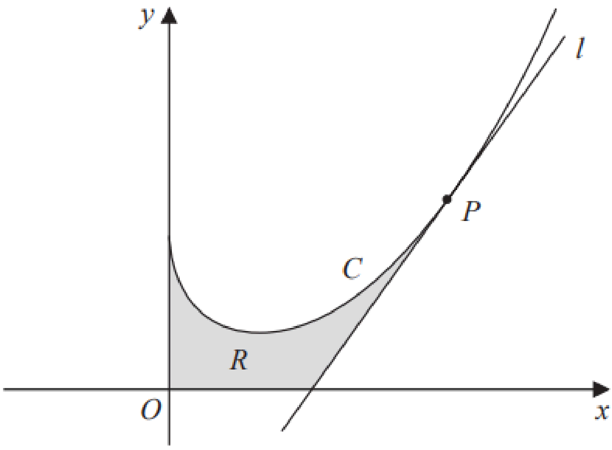


Figure 2

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

Figure 2 shows a sketch of part of the curve C with equation

$$y = \frac{1}{3}x^2 - 2\sqrt{x} + 3 \qquad x \geqslant 0$$

The point P lies on C and has x coordinate 4

The line l is the tangent to C at P.

(a) Show that l has equation

$$13x - 6y - 26 = 0$$

(5)

The region R, shown shaded in Figure 2, is bounded by the y-axis, the curve C, the line l and the x-axis.

(b) Find the exact area of R.

(5)

ANSWER

Question	Scheme	Marks	AOs
10(a)	$y=\frac{1}{3}x^2-2\sqrt{x}+3 \Rightarrow \frac{dy}{dx}=\frac{2}{3}x-x^{-\frac{1}{2}}$	M1 A1	1.1b 1.1b
	$x=4 \Rightarrow y=\frac{13}{3}$	B1	1.1b
	$\left(\frac{dy}{dx}\right)_{x=4}=\frac{2}{3}\times 4-4^{-\frac{1}{2}}\left(=\frac{13}{6}\right) \quad \therefore y-\frac{13}{3}=\frac{13}{6}(x-4)$	M1	2.1
	$13x-6y-26=0$*	A1*	1.1b
		(5)	
(b)	$\int\left(\frac{x^2}{3}-2\sqrt{x}+3\right)dx=\frac{x^3}{9}-\frac{4}{3}x^{\frac{3}{2}}+3x(+c)$	M1 A1	1.1b 1.1b
	$y=0 \Rightarrow x=2$	B1	2.2a
	Area of R is $\left[\frac{x^3}{9}-\frac{4}{3}x^{\frac{3}{2}}+3x\right]_0^4-\frac{1}{2}\times(4-"2")\times"\frac{13}{3}"=\frac{76}{9}-\frac{13}{3}$	M1	3.1a
	$=\frac{37}{9}$	A1	1.1b
		(5)	
		(10 marks)	

Video solution:
https://youtu.be/c8r2GvovEUg

June 2022 Question 1

1. Find

$$\int \left(8x^3 - \frac{3}{2\sqrt{x}} + 5 \right) dx$$

giving your answer in simplest form.

(4)

ANSWER

Question	Scheme	Marks	AOs
1	$x^n \to x^{n+1}$	M1	1.1b
	$\int \left(8x^3 - \frac{3}{2\sqrt{x}} + 5 \right) dx = \frac{8x^4}{4} \ldots + 5x$	A1	1.1b
	$= \ldots - 2 \times \frac{3}{2} x^{\frac{1}{2}} + \ldots$	A1	1.1b
	$= 2x^4 - 3x^{\frac{1}{2}} + 5x + c$	A1	1.1b
		(4)	
			(4 marks)

November 2021 Question 3

3. Find

$$\int \frac{3x^4 - 4}{2x^3} \, dx$$

writing your answer in simplest form.

(4)

ANSWER

Question	Scheme	Marks	AOs
3	$\int \frac{3x^4 - 4}{2x^3} \, dx = \int \frac{3}{2}x - 2x^{-3} \, dx$	M1 A1	1.1b 1.1b
	$= \frac{3}{2} \times \frac{x^2}{2} - 2 \times \frac{x^{-2}}{-2} \quad (+c)$	dM1	3.1a
	$= \frac{3}{4}x^2 + \frac{1}{x^2} + c$ o.e	A1	1.1b
		(4)	
		(4 marks)	

7. **In this question you should show all stages of your working.**

Solutions relying entirely on calculator technology are not acceptable.

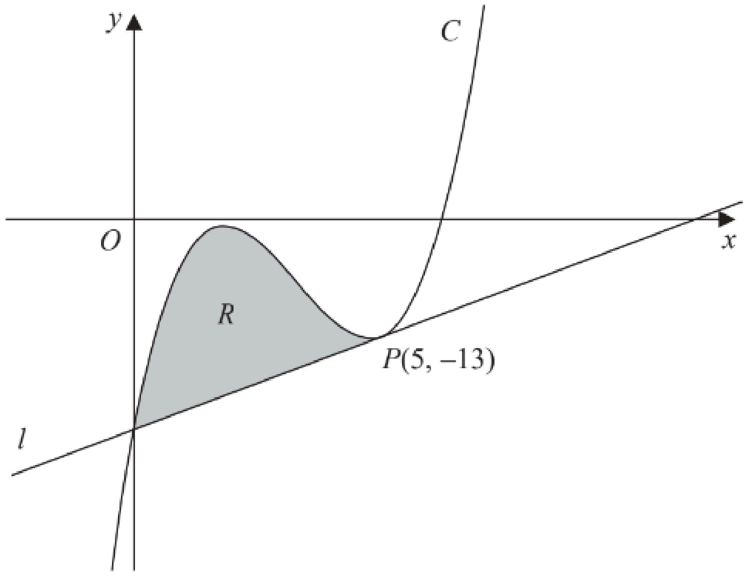


Figure 2

Figure 2 shows a sketch of part of the curve C with equation

$$y = x^3 - 10x^2 + 27x - 23$$

The point $P(5, -13)$ lies on C

The line l is the tangent to C at P

(a) Use differentiation to find the equation of l, giving your answer in the form $y = mx + c$ where m and c are integers to be found.

(4)

(b) Hence verify that l meets C again on the y-axis.

(1)

The finite region R, shown shaded in Figure 2, is bounded by the curve C and the line l.

(c) Use algebraic integration to find the exact area of R.

(4)

ANSWER

Question	Scheme	Marks	AOs
7(a)	$y = x^3 - 10x^2 + 27x - 23 \Rightarrow \frac{dy}{dx} = 3x^2 - 20x + 27$	B1	1.1b
	$\left(\frac{dy}{dx}\right)_{x=5} = 3\times5^2 - 20\times5 + 27 (= 2)$	M1	1.1b
	$y + 13 = 2(x - 5)$	M1	2.1
	$y = 2x - 23$	A1	1.1b
		(4)	
(b)	Both C and l pass through (0, –23) and so C meets l again on the y-axis	B1	2.2a
		(1)	
(c)	$\pm\int \left(x^3 - 10x^2 + 27x - 23 - (2x - 23)\right) dx$ $= \pm\left(\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{25}{2}x^2\right)$	M1 A1ft	1.1b 1.1b
	$\left[\frac{x^4}{4} - \frac{10}{3}x^3 + \frac{25}{2}x^2\right]_0^5$ $= \left(\frac{625}{4} - \frac{1250}{3} + \frac{625}{2}\right)(-0)$	dM1	2.1
	$= \frac{625}{12}$	A1	1.1b
		(4)	

November 2021 Question 14

14. A curve C has equation $y = f(x)$ where

$$f(x) = -3x^2 + 12x + 8$$

(a) Write f(x) in the form

$$a(x + b)^2 + c$$

where a, b and c are constants to be found.

(3)

The curve C has a maximum turning point at M.

(b) Find the coordinates of M.

(2)

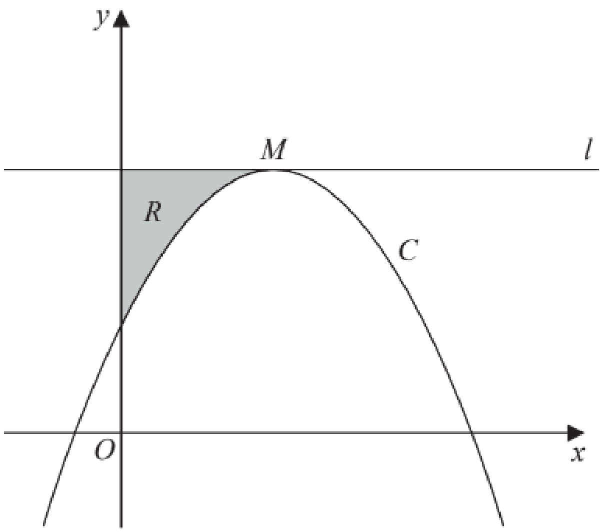


Figure 3

Figure 3 shows a sketch of the curve C.

The line l passes through M and is parallel to the x-axis.

The region R, shown shaded in Figure 3, is bounded by C, l and the y-axis.

(c) Using algebraic integration, find the area of R.

(5)

ANSWER

Question	Scheme	Marks	AOs
14 (a)	$\mathrm{f}(x) = -3x^2 + 12x + 8 = -3(x \pm 2)^2 + \ldots$	M1	1.1b
	$= -3(x-2)^2 + \ldots$	A1	1.1b
	$= -3(x-2)^2 + 20$	A1	1.1b
		(3)	
(b)	Coordinates of $M = (2, 20)$	B1ft B1ft	1.1b 2.2a
		(2)	
(c)	$\int -3x^2 + 12x + 8 \, \mathrm{d}x = -x^3 + 6x^2 + 8x$	M1 A1	1.1b 1.1b
	Method to find $R =$ their $2 \times 20 - \int_0^2 \left(-3x^2 + 12x + 8\right) \mathrm{d}x$	M1	3.1a
	$R = 40 - \left[-2^3 + 24 + 16\right]$	dM1	1.1b
	$= 8$	A1	1.1b
		(5)	
			(10 marks)

November 2020 Question 7

7. Given that k is a positive constant and $\int_1^k \left(\frac{5}{2\sqrt{x}} + 3\right) \mathrm{d}x = 4$

(a) show that $3k + 5\sqrt{k} - 12 = 0$

(4)

(b) Hence, using algebra, find any values of k such that

$$\int_1^k \left(\frac{5}{2\sqrt{x}} + 3\right) \mathrm{d}x = 4$$

(4)

ANSWER

Question	Scheme	Marks	AOs
7 (a)	$x^n \to x^{n+1}$	M1	1.1b
	$\int \left(\frac{5}{2\sqrt{x}} + 3\right) \mathrm{d}x = 5\sqrt{x} + 3x$	A1	1.1b
	$\left[5\sqrt{x} + 3x\right]_1^k = 4 \Rightarrow 5\sqrt{k} + 3k - 8 = 4$	dM1	1.1b
	$3k + 5\sqrt{k} - 12 = 0$ *	A1*	2.1
		(4)	
(b)	$3k + 5\sqrt{k} - 12 = 0 \Rightarrow \left(3\sqrt{k} - 4\right)\left(\sqrt{k} + 3\right) = 0$	M1	3.1a
	$\sqrt{k} = \frac{4}{3}, (-3)$	A1	1.1b
	$\sqrt{k} = \ldots \Rightarrow k = \ldots$ oe	dM1	1.1b
	$k = \frac{16}{9}, \cancel{9}$	A1	2.3
		(4)	
			(8 marks)

Video solution:
https://youtu.be/cSyIVLmiM-s

November 2020 Question 10

10. $$g(x) = 2x^3 + x^2 - 41x - 70$$

(a) Use the factor theorem to show that $g(x)$ is divisible by $(x - 5)$.

(2)

(b) Hence, showing all your working, write $g(x)$ as a product of three linear factors.

(4)

The finite region R is bounded by the curve with equation $y = g(x)$ and the x-axis, and lies below the x-axis.

(c) Find, using algebraic integration, the exact value of the area of R.

(4)

ANSWER

Question	Scheme	Marks	AOs
10 (a)	$g(5)=2\times5^3+5^2-41\times5-70=...$	M1	1.1a
	$g(5)=0\Rightarrow(x-5)$ is a factor, hence $g(x)$ is divisible by $(x-5)$.	A1	2.4
		(2)	
(b)	$2x^3+x^2-41x-70=(x-5)(2x^2...x\pm14)$	M1	1.1b
	$=(x-5)(2x^2+11x+14)$	A1	1.1b
	Attempts to factorise quadratic factor	dM1	1.1b
	$(g(x))=(x-5)(2x+7)(x+2)$	A1	1.1b
		(4)	
(c)	$\int 2x^3+x^2-41x-70\,dx=\frac{1}{2}x^4+\frac{1}{3}x^3-\frac{41}{2}x^2-70x$	M1 A1	1.1b 1.1b
	Deduces the need to use $\int_{-2}^{5}g(x)dx$ $-\frac{1525}{3}-\frac{190}{3}$	M1	2.2a
	Area $=571\frac{2}{3}$	A1	2.1
		(4)	
			(10 marks)

Video solution:
https://youtu.be/7YOKxoH_X58

November 2020 Question 8 Paper 2 (A-Level)

8. A curve C has equation $y = \mathrm{f}(x)$

Given that

- $\mathrm{f}'(x) = 6x^2 + ax - 23$ where a is a constant
- the y intercept of C is -12
- $(x + 4)$ is a factor of $\mathrm{f}(x)$

find, in simplest form, $\mathrm{f}(x)$

(6)

ANSWER

8	$\mathrm{f}'(x) = 6x^2 + ax - 23 \Rightarrow \mathrm{f}(x) = 2x^3 + \frac{1}{2}ax^2 - 23x + c$	M1 A1	1.1b 1.1b
	$"c" = -12$	B1	2.2a
	$\mathrm{f}(-4) = 0 \Rightarrow 2\times(-4)^3 + \frac{1}{2}a(-4)^2 - 23(-4) - 12 = 0$	dM1	3.1a
	$a = \ldots\ (6)$	dM1	1.1b
	$(\mathrm{f}(x) =)2x^3 + 3x^2 - 23x - 12$ Or Equivalent e.g. $(\mathrm{f}(x) =)(x+4)(2x^2 - 5x - 3)$ $\quad (\mathrm{f}(x) =)(x+4)(2x+1)(x-3)$	A1cso	2.1
		(6)	
			(6 marks)

June 2019 Question 3

3. (a) Given that k is a constant, find

$$\int \left(\frac{4}{x^3} + kx \right) dx$$

simplifying your answer.

(3)

(b) Hence find the value of k such that

$$\int_{0.5}^{2} \left(\frac{4}{x^3} + kx \right) dx = 8$$

(3)

ANSWER

Question	Scheme	Marks	AOs
3(a)	$x^n \to x^{n+1}$	M1	1.1b
	$\int \left(\frac{4}{x^3} + kx \right) dx = -\frac{2}{x^2} + \frac{1}{2}kx^2 + c$	A1 A1	1.1b 1.1b
		(3)	
(b)	$\left[-\frac{2}{x^2} + \frac{1}{2}kx^2 \right]_{0.5}^{2} = \left(-\frac{2}{2^2} + \frac{1}{2}k \times 4 \right) - \left(-\frac{2}{(0.5)^2} + \frac{1}{2}k \times (0.5)^2 \right) = 8$	M1	1.1b
	$7.5 + \frac{15}{8}k = 8 \Rightarrow k = \ldots$	dM1	1.1b
	$k = \frac{4}{15}$ oe	A1	1.1b
		(3)	
			(6 marks)

June 2019 Question 8 Paper 1 (A-Level)

8.

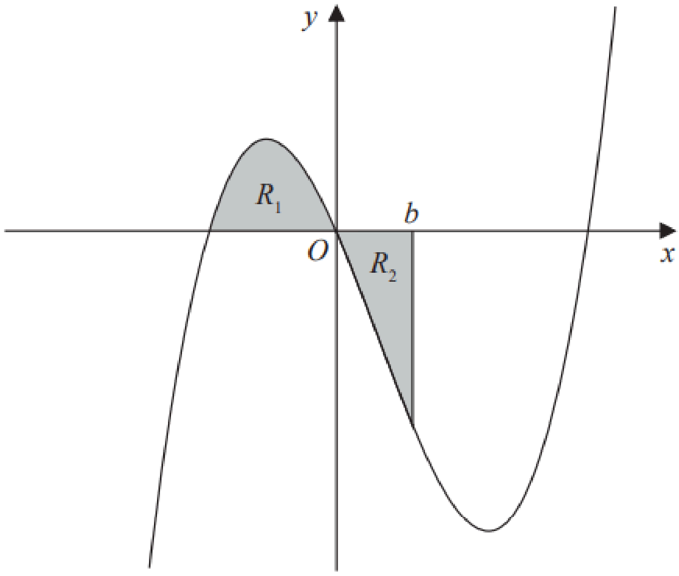


Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = x(x + 2)(x - 4)$.

The region R_1 shown shaded in Figure 2 is bounded by the curve and the negative x-axis.

(a) Show that the exact area of R_1 is $\frac{20}{3}$

(4)

The region R_2 also shown shaded in Figure 2 is bounded by the curve, the positive x-axis and the line with equation $x = b$, where b is a positive constant and $0 < b < 4$

Given that the area of R_1 is equal to the area of R_2

(b) verify that b satisfies the equation

$$(b + 2)^2 (3b^2 - 20b + 20) = 0$$

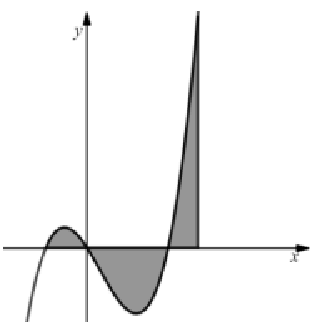
(4)

The roots of the equation $3b^2 - 20b + 20 = 0$ are 1.225 and 5.442 to 3 decimal places. The value of b is therefore 1.225 to 3 decimal places.

(c) Explain, with the aid of a diagram, the significance of the root 5.442

(2)

ANSWER

Question	Scheme	Marks	AOs
8 (a)	$y = x(x+2)(x-4) = x^3 - 2x^2 - 8x$	B1	1.1b
	$\int x^3 - 2x^2 - 8x \, dx \to \frac{1}{4}x^4 - \frac{2}{3}x^3 - 4x^2$	M1	1.1b
	Attempts area using the correct strategy $\int_{-2}^{0} y \, dx$	dM1	2.2a
	$\left[\frac{1}{4}x^4 - \frac{2}{3}x^3 - 4x^2\right]_{-2}^{0} = (0) - \left(4 - \frac{-16}{3} - 16\right) = \frac{20}{3}$ *	A1*	2.1
		(4)	
(b)	For setting 'their' $\frac{1}{4}b^4 - \frac{2}{3}b^3 - 4b^2 = \pm\frac{20}{3}$	M1	1.1b
	For correctly deducing that $3b^4 - 8b^3 - 48b^2 + 80 = 0$	A1	2.2a
	Attempts to factorise $3b^4 - 8b^3 - 48b^2 \pm 80 = (b+2)(b+2)(3b^2 ... b ... 20)$	M1	1.1b
	Achieves $(b+2)^2(3b^2 - 20b + 20) = 0$ with no errors	A1*	2.1
		(4)	
(c)	 States that between $x = -2$ and $x = 5.442$ the area above the x-axis = area below the x-axis	B1 B1	1.1b 2.4
		(2)	
			(10 marks)

June 2018 Question 1

1. Find

$$\int\left(\frac{2}{3}x^3 - 6\sqrt{x} + 1\right)\mathrm{d}x$$

giving your answer in its simplest form.

(4)

ANSWER

Question	Scheme	Marks	AOs
1	$\int\left(\frac{2}{3}x^3 - 6\sqrt{x}+1\right)\mathrm{d}x$		
	Attempts to integrate awarded for any correct power	M1	1.1a
	$\int\left(\frac{2}{3}x^3 - 6\sqrt{x}+1\right)\mathrm{d}x = \frac{2}{3}\times\frac{x^4}{4}+\ldots+x$	A1	1.1b
	$= \ldots - 6\frac{x^{\frac{3}{2}}}{\frac{3}{2}}+\ldots$	A1	1.1b
	$= \frac{1}{6}x^4 - 4x^{\frac{3}{2}} + x + c$	A1	1.1b
			(4 marks)

June 2018 Question 15

15.

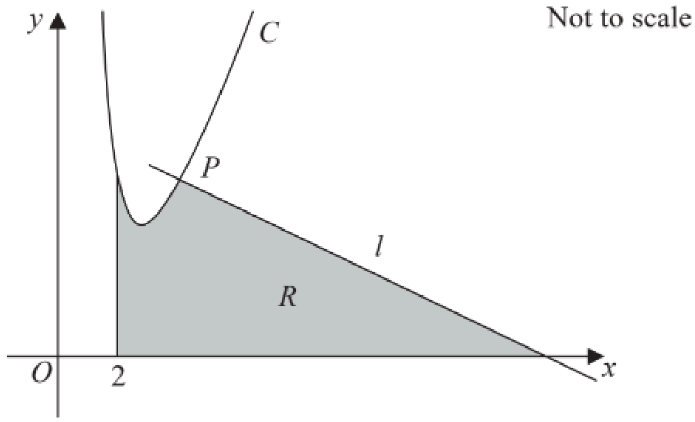


Figure 4

Figure 4 shows a sketch of part of the curve C with equation

$$y = \frac{32}{x^2} + 3x - 8, \qquad x > 0$$

The point P (4, 6) lies on C.
The line l is the normal to C at the point P.

The region R, shown shaded in Figure 4, is bounded by the line l, the curve C, the line with equation $x = 2$ and the x-axis.

Show that the area of R is 46
(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(10)

ANSWER

Question	Scheme	Marks	AOs
15.	For the complete strategy of finding where the normal cuts the x-axis. Key points that must be seen are • Attempt at differentiation • Attempt at using a changed gradient to find equation of normal • Correct attempt to find where normal cuts the x - axis	M1	3.1a
	$y=\frac{32}{x^2}+3x-8 \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x}=-\frac{64}{x^3}+3$	M1 A1	1.1b 1.1b
	For a correct method of attempting to find Either the equation of the normal: this requires substituting $x=4$ in their $\frac{\mathrm{d}y}{\mathrm{d}x}=-\frac{64}{x^3}+3=(2)$, then using the perpendicular gradient rule to find the equation of normal $y-6="-\frac{1}{2}"(x-4)$ Or where the equation of the normal at (4,6) cuts the x - axis. As above but may not see equation of normal. Eg $0-6="-\frac{1}{2}"(x-4) \Rightarrow x=\ldots$ or an attempt using just gradients $"-\frac{1}{2}"=\frac{6}{a-4} \Rightarrow a=\ldots$	dM1	2.1
	Normal cuts the x-axis at $x=16$	A1	1.1b

	For the complete strategy of finding the values of the two key areas. Points that must be seen are • There must be an attempt to find the area under the curve by integrating between 2 and 4 • There must be an attempt to find the area of a triangle using $\frac{1}{2}\times('16'-4)\times 6$ or $\int_4^{"16"} "\left(-\frac{1}{2}x+8\right)"\mathrm{d}x$	M1	3.1a
	$\int \frac{32}{x^2}+3x-8\,\mathrm{d}x = -\frac{32}{x}+\frac{3}{2}x^2-8x$	M1 A1	1.1b 1.1b
	Area under curve = $=\left[-\frac{32}{x}+\frac{3}{2}x^2-8x\right]_2^4 = (-16)-(-26)=(10)$	dM1	1.1b
	Total area $=10+\ 36\ =46$ *	A1*	2.1
		(10)	
			(10 marks)

Video solution:

https://youtu.be/OPmmw6wUOFc