5.10 Drawing Other Graphs: Cubic/Reciprocal: 30-minute Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out the value of y for $y = x^3$ when x = -1 and when x = 3.

(a) x = -1, y = ____ **(1)**

(b) x = 3, y = ____ **(1)**

(Total for Question 1 is 2 marks)

2 Solve the equation $x^3 - 8 = 0$. Give the value of x.

(Total for Question 2 is 1 mark)

3 A student draws the graph of y = 1/x and writes 'the graph crosses the x-axis at x = 0'. Is the student correct? Give a short reason.

(Total for Question 3 is 2 marks)

4 For x = 1 and x = 2, calculate the values of y for both $y = x^3$ and y = 1/x. Then state which graph has the larger y-value at x = 2.

(Total for Question 4 is 3 marks)

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5 Describe in words how the graph of $y = (x - 1)^3$ is related to the graph of $y = x^3$. Give the translation only.

(Total for Question 5 is 1 mark)

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6 Sketch the graph of $y = x^3$ for $-2 \leq x \leq 2$. Mark clearly the points where $x = -1$, 0 and 1 and give their coordinates.

(a) Mark the points for $x = -1$, 0 and 1 and write their coordinates. **(2)**

(Total for Question 6 is 2 marks)

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7 Match each equation to the description of its graph.

(a) $y = 2x + 5$ **(1)**

- ☐ i) A straight line with a positive gradient
- ☐ ii) An upside-down U-shaped curve with one maximum point
- ☐ iii) A wave-shaped curve through the origin that increases throughout
- ☐ iv) A two-branch curve lying in the second and fourth quadrants

(b) $y = 8 - x^2$ **(1)**

- ☐ i) A straight line with a positive gradient
- ☐ ii) An upside-down U-shaped curve with one maximum point
- ☐ iii) A wave-shaped curve through the origin that increases throughout
- ☐ iv) A two-branch curve lying in the second and fourth quadrants

(c) $y = x^3 + x$ **(1)**

- ☐ i) A straight line with a positive gradient
- ☐ ii) An upside-down U-shaped curve with one maximum point
- ☐ iii) A wave-shaped curve through the origin that increases throughout
- ☐ iv) A two-branch curve lying in the second and fourth quadrants

(d) $y = -6/x$ **(1)**

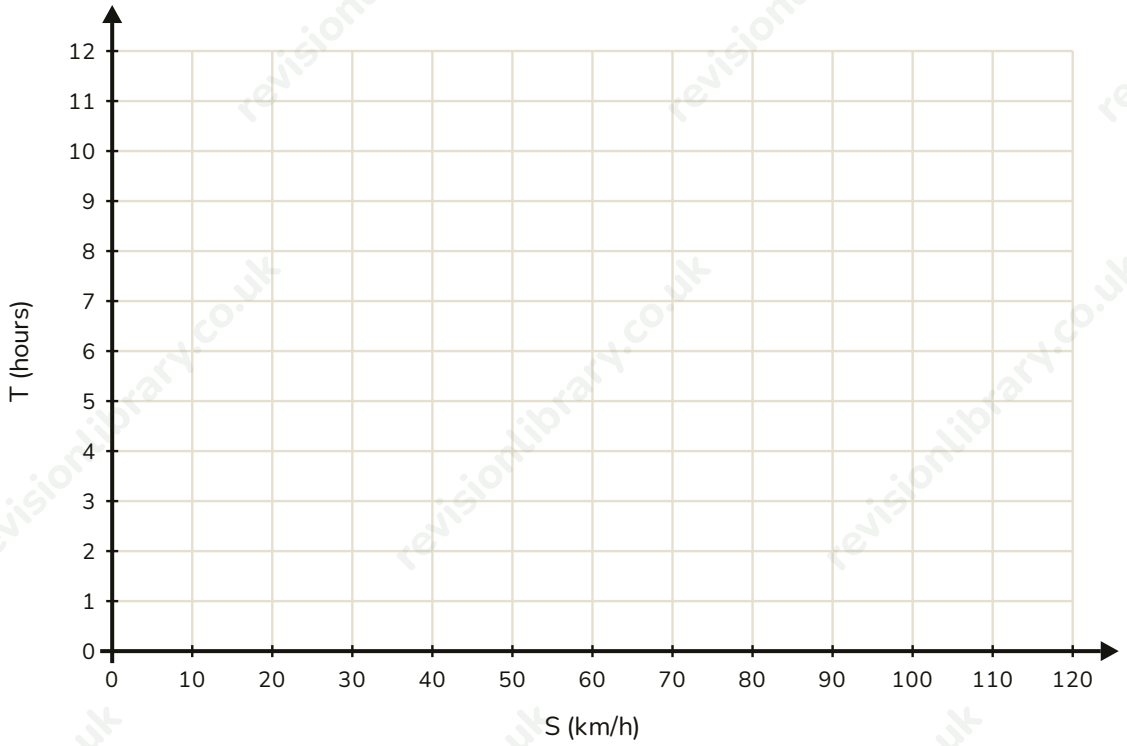
- ☐ i) A straight line with a positive gradient
- ☐ ii) An upside-down U-shaped curve with one maximum point
- ☐ iii) A wave-shaped curve through the origin that increases throughout
- ☐ iv) A two-branch curve lying in the second and fourth quadrants

(e) Explain why the graph of $y = x^3 + x$ is increasing for all values of x. **(1)**

(Total for Question 7 is 5 marks)

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8 A car travels a fixed distance of 240 km. The time taken, T hours, at an average speed of S km/h is given by T = 240/S.



(a) Complete the table of values for T = 240/S. **(3)**

S	20	30	40	48	60	80	100	120
T	12	_	6	_	4	_	2.4	_

(b) On the grid, plot the points from the table and draw a smooth curve for T against S. **(2)**

(c) Use the graph to estimate the speed needed to complete the journey in 3 hours. **(1)**

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(d) Calculate the exact time taken, in hours and minutes, at an average speed of 100 km/h. **(2)**

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(Total for Question 8 is 8 marks)

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Mark scheme · 5.10 Drawing Other Graphs: Cubic/Reciprocal: 30-minute Pack

Question 1

(a) -1 cao **B1**

(a) Answer: -1

(b) 27 cao **B1**

(b) Answer: 27

Question 2

2 cao **B1**

Answer: 2

Question 3

state not correct and give reason that y = 1/x is undefined at x = 0 or vertical asymptote at x=0 **M1**

answer: Not correct; y is undefined at x = 0 so the curve does not cross the x-axis cao **A1**

Answer: No. Not correct; y = 1/x is undefined at x = 0 (vertical asymptote), so the graph does not cross the x-axis.

Question 4

calculate $y = x^3$ for x = 1 and x = 2 (1 and 8) **M1**

calculate y = 1/x for x = 1 and x = 2 (1 and 1/2) **M1**

statement: $y = x^3$ has larger value at x = 2 (8 > 1/2) cao **A1**

Answer: At x=1: $y=x^3$ = 1, y=1/x = 1. At x=2: $y=x^3$ = 8, y=1/x = 1/2. The graph $y = x^3$ has the larger y-value at x = 2.

Question 5

translated 1 unit to the right oe **B1**

Answer: Translated 1 unit to the right.

Question 6

(a) (-1, -1), (0, 0) and (1, 1) all correctly stated **B1**

(a) sketch shows cubic shape (increasing, point of inflection at origin) with approximate shape through marked points **B1**

(a) Answer: (-1, -1), (0, 0), (1, 1)

Question 7

(a) i **B1**

(a) Answer: i) straight line, positive gradient

(b) ii **B1**

(b) Answer: ii) n-shaped curve with a maximum

(c) iii **B1**

(c) Answer: iii) wave-shaped increasing cubic curve

(d) iv **B1**

(d) Answer: iv) two-branch reciprocal curve in quadrants 2 and 4

(e) both x^3 and x individually increase as x increases, so their sum always increases oe **B1**

(e) Answer: Both x^3 and x increase as x increases, so x^3 + x increases throughout

Question 8

(a) at least one correct calculation shown, e.g. 240 / 48 = 5 **M1**

(a) at least two of the four missing values correct **A1**

(a) all four missing values correct: 8, 5, 3, 2 **A1**

(a) Answer: S=30: 8, S=48: 5, S=80: 3, S=120: 2

(b) all 8 points plotted correctly ft from table **B1**

(b) smooth decreasing curve drawn through all points, approaching but never touching the S-axis **B1**

(b) Answer: Smooth decreasing reciprocal-shaped curve through the 8 points

(c) awrt 80 km/h (range 76 to 84), ft from candidate's graph **B1**

(c) Answer: 80 km/h

(d) 240 / 100 = 2.4 (hours) **M1**

(d) 2 hours 24 minutes cao **A1**

(d) Answer: 2 hours 24 minutes

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