Write your name here

Surname	Other Names

AS/A Level Mathematics

Sketching and Transforming Curves

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
- Answer the questions in the spaces provided
– there may be more space than you need.
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- The marks for **each** question are shown in brackets
– use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

1 $f(x) = (x + 3)(x + 2)(x - 1)$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(i) $y = f(x - 3)$ **(2)**

(ii) $y = f(-x)$ **(2)**

(Total for question 1 is 7 marks)

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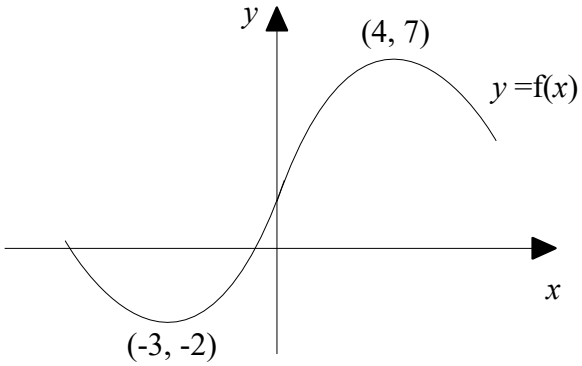
2 (a) Sketch on the same diagram the curves $y = x^2 + 5x$ and $y = -\frac{1}{x}$ **(4)**

(b) State, giving a reason, the number of real solutions to the equation $x^2 + 5x + \frac{1}{x} = 0$ **(2)**

(Total for question 2 is 6 marks)



3 The sketch shows the graph of y = f(x). The curve has a minimum at (-3,-2) and a maximum at (4,7).

Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(i) $y = f(x) + 2$ **(2)**

(ii) $y = -f(x)$ **(2)**

(Total for question 3 is 4 marks)

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4 $f(x) = x^2 + 4x + 5$

(a) Express $f(x)$ in the form $(x + a)^2 + b$, and state the coordinates of the minimum point of $y = f(x)$. **(3)**

(b) Sketch the graph of $y = f(x)$ showing the coordinates of intersection with the coordinate axis. **(3)**

(c) Find the minimum points of these curves

(i) $y = 2f(x)$ **(2)**

(ii) $y = f(2x)$ **(2)**

(Total for question 4 is 8 marks)

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5 $f(x) = x^3 + 4x^2 - 5x$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(2)

(i) $y = f(x + 1)$

(2)

(ii) $y = f(2x)$

(Total for question 5 is 7 marks)

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6 Sketch graph of $y = \frac{1}{x} + 2$, showing the points of intersection with the coordinate axis and stating the equations of any asymptotes.

(Total for question 6 is 3 marks)

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7 $f(x) = (x + 4)(x - 1)(2 - x)$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(i) $y = f(x + 2)$ **(2)**

(ii) $y = -f(x)$ **(2)**

(Total for question 7 is 7 marks)

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8 $f(x) = (x + 3)(x - 1)^2$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Find the equation of $y = f(x + 2)$ in the form $y = (x + a)(x + b)^2$ **(2)**

(Total for question 8 is 5 marks)
