



IGCSE · Cambridge (CIE) · Further Maths

🕒 1 hour ❓ 18 questions

Exam Questions

Equations, Inequalities & Graphs

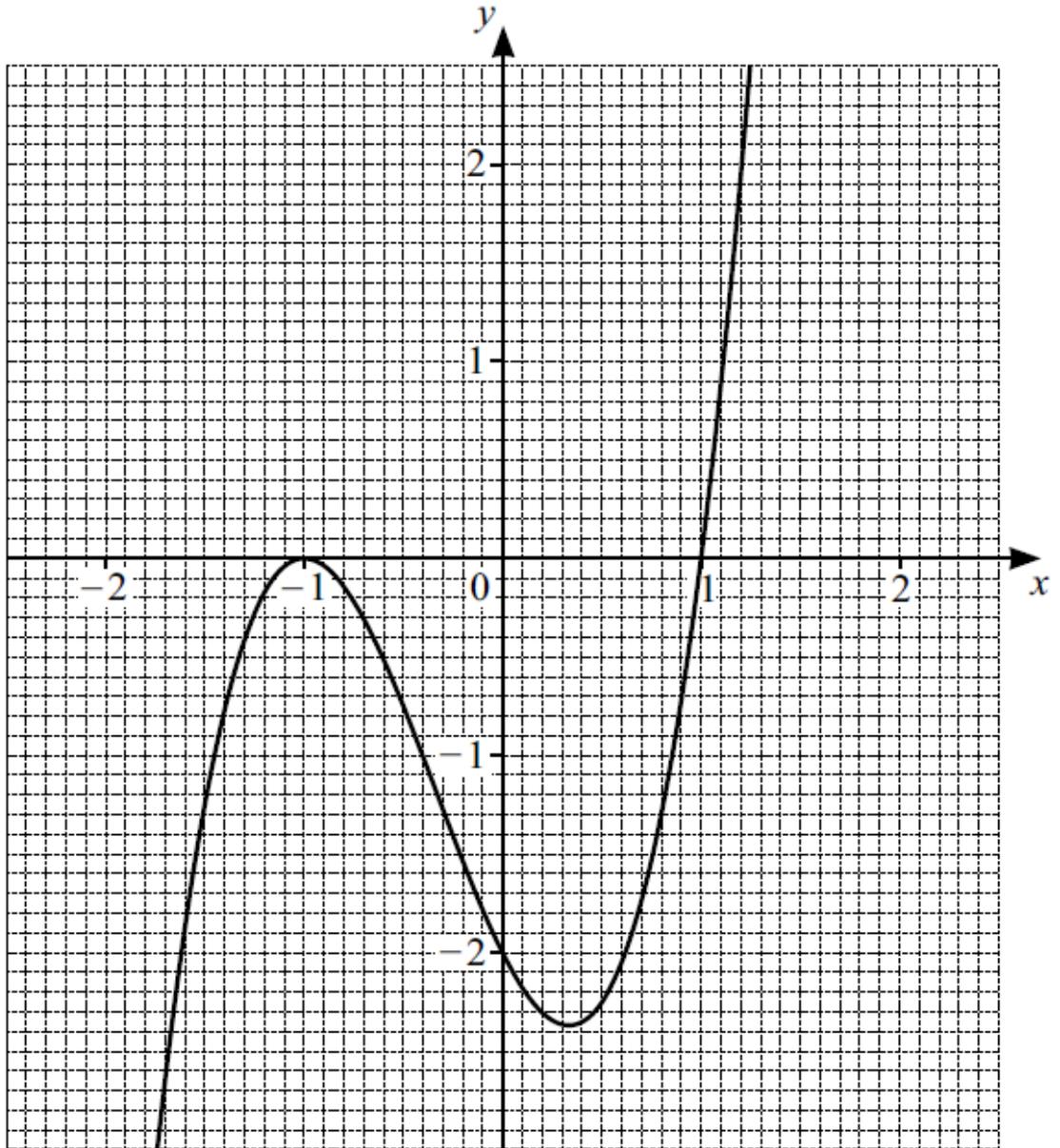
Modulus Functions / Graphs of Cubic Polynomials

Medium (7 questions)	/30
Hard (6 questions)	/24
Very Hard (5 questions)	/22
Total Marks	/76

Medium Questions

1 Solve the equation $5|5x - 2| - 1 = 14$.

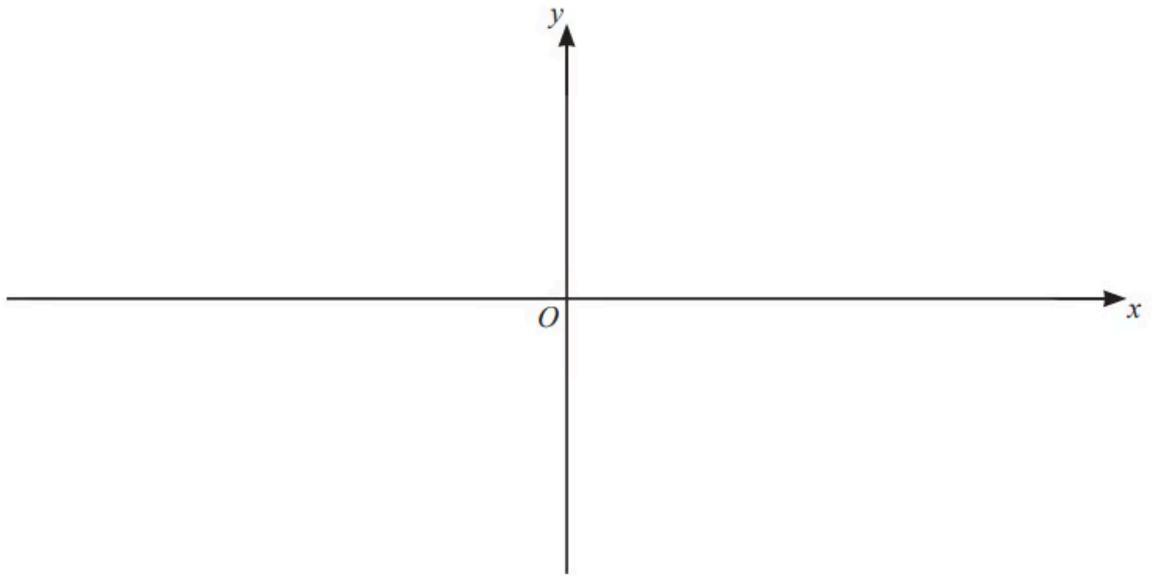
(3 marks)



The diagram shows the graph of $y = f(x)$, where $f(x) = 2(x + 1)^2(x - 1)$.
Use the graph to solve the inequality $f(x) \leq -1$.

(3 marks)

- 3 (a)** On the axes, sketch the graph of $y = 5(x + 1)(3x - 2)(x - 2)$, stating the intercepts with the coordinate axes.

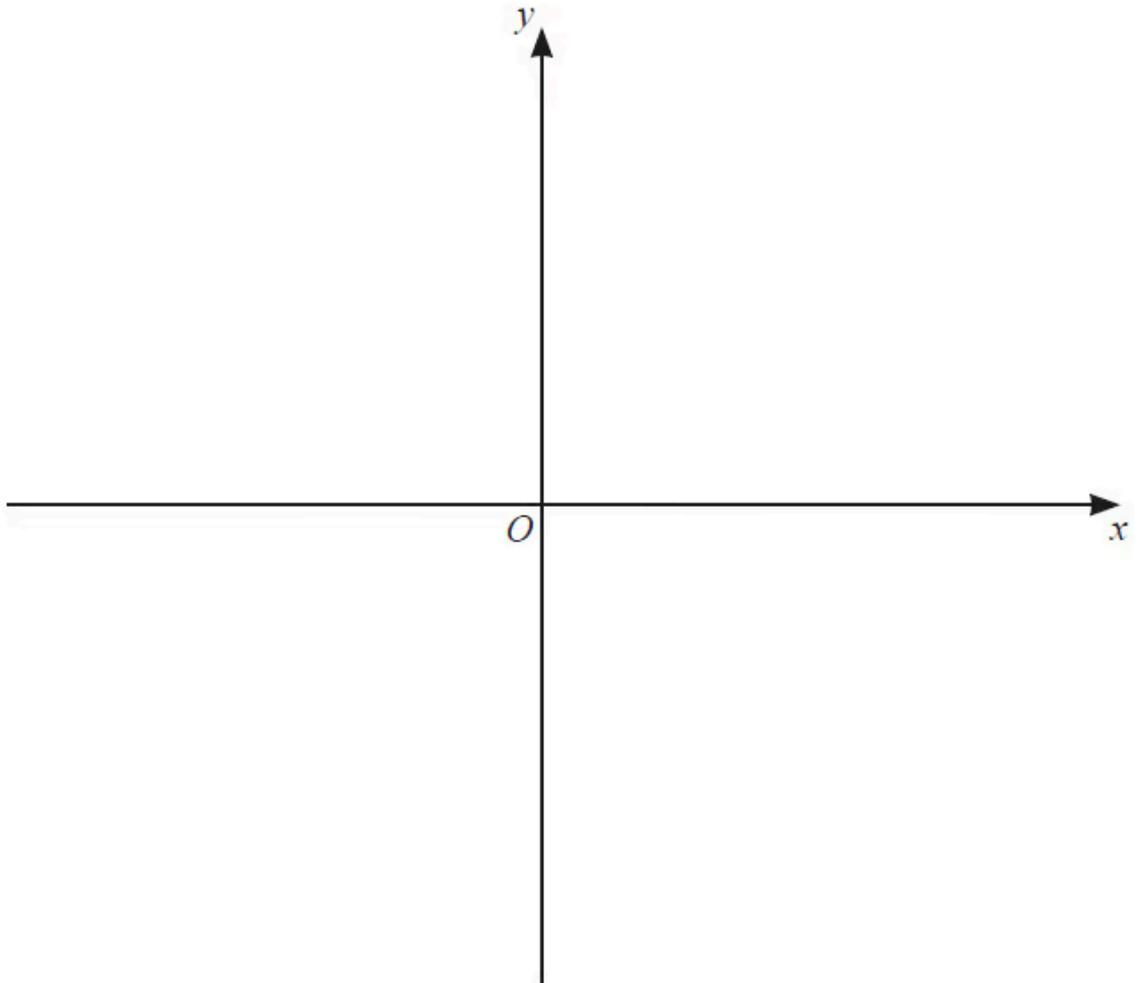


(3 marks)

- (b)** Hence find the values of x for which $5(x + 1)(3x - 2)(x - 2) > 0$.

(2 marks)

- 4 (a)** On the axes below sketch the graph of $y = -3(x - 2)(x - 4)(x + 1)$, showing the coordinates of the points where the curve intersects the coordinate axes.

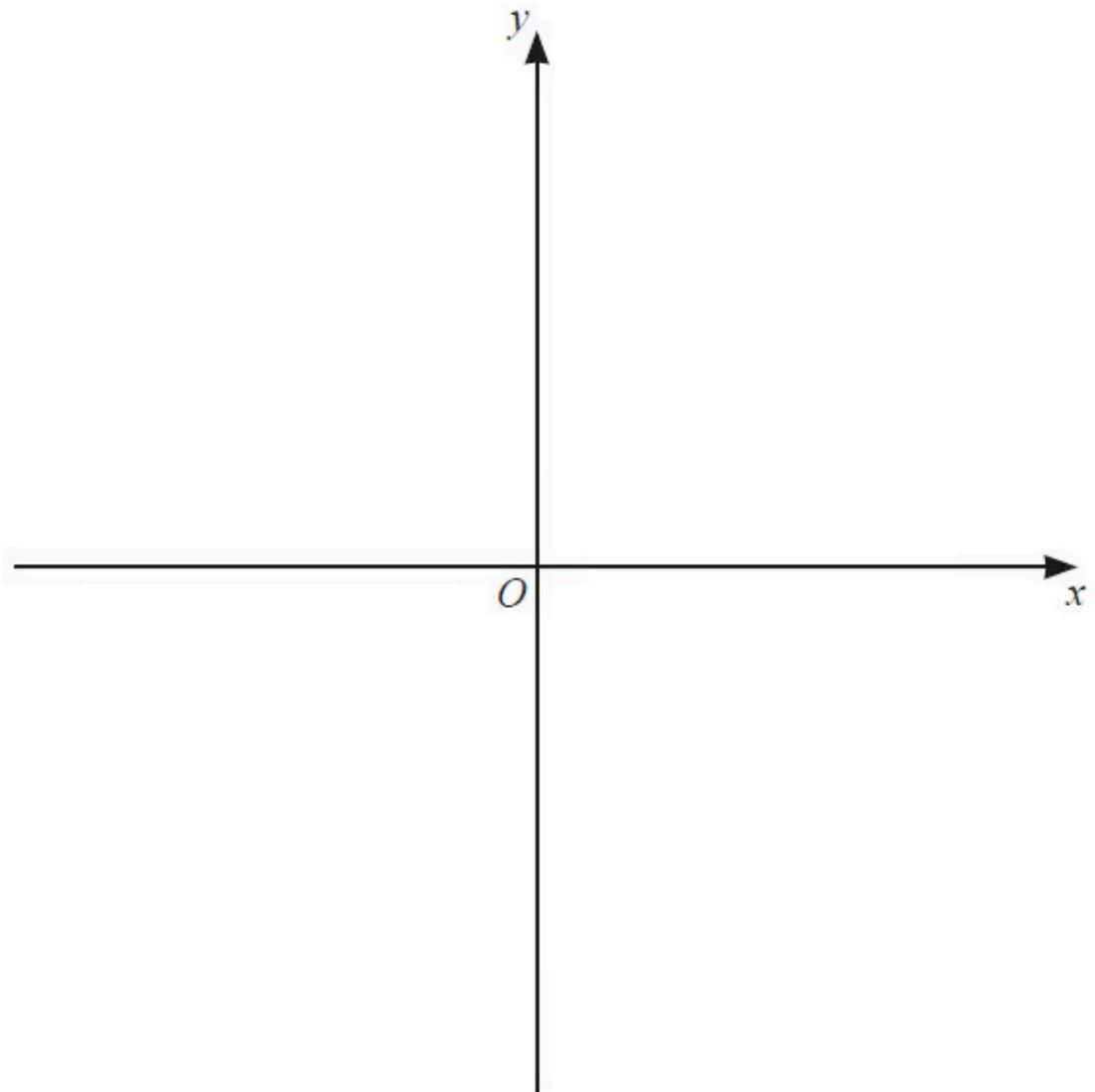


(3 marks)

- (b)** Hence find the values of x for which $-3(x - 2)(x - 4)(x + 1) > 0$.

(2 marks)

- 5 (a)** On the axes below, sketch the graph of $y = |5x - 7|$, showing the coordinates of the points where the graph meets the coordinate axes.

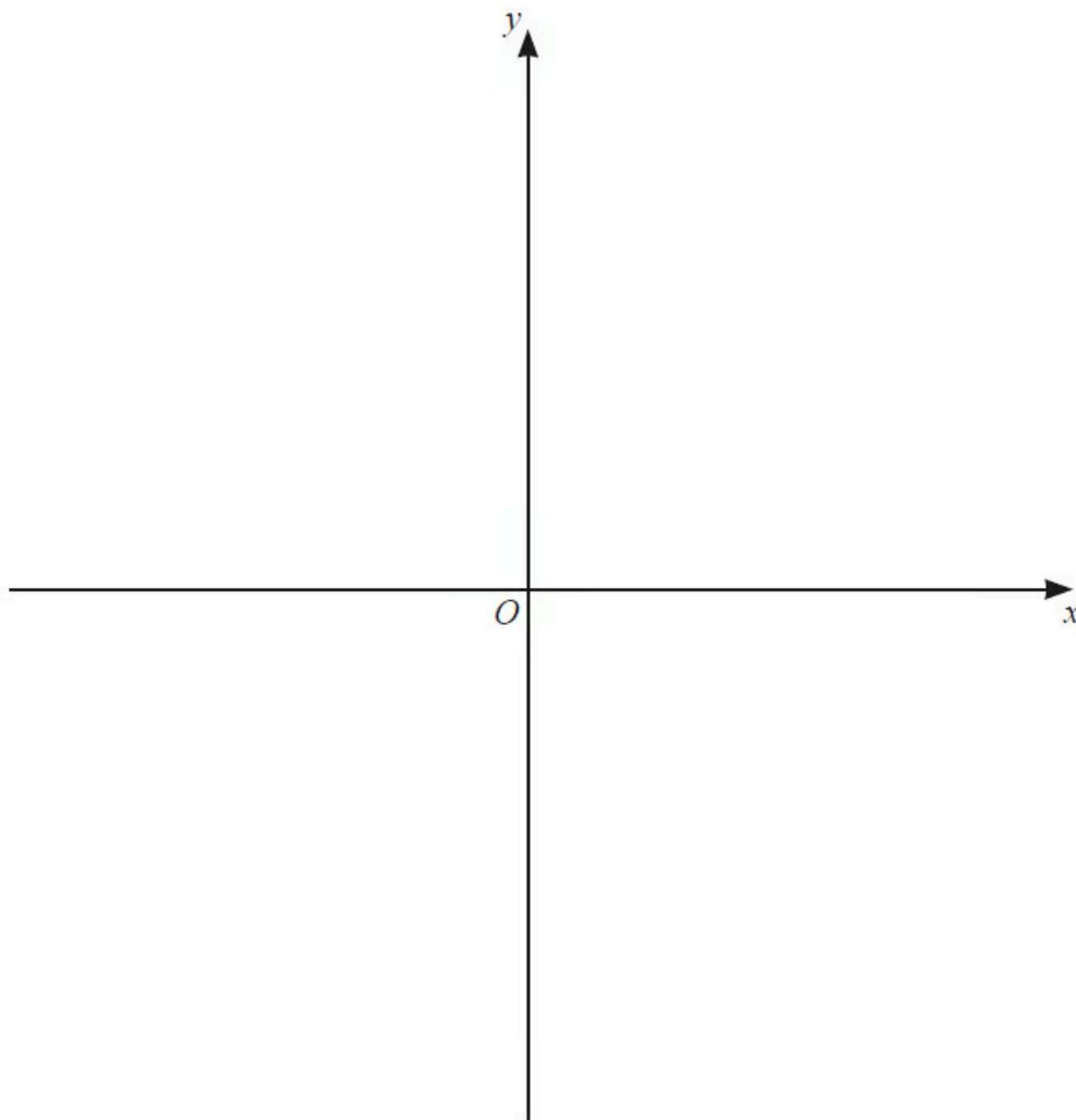


(3 marks)

(b) Solve $5|5x - 7| - 1 = 14$.

(3 marks)

- 6 (a)** On the axes below, sketch the graph of $y = -(x + 2)(x - 1)(x - 6)$, showing the coordinates of the points where the graph meets the coordinate axes.



(2 marks)

- (b)** Hence solve $-(x + 2)(x - 1)(x - 6) \leq 0$.

(2 marks)

- 7** Solve the following equation.

$$2|x - 1| \leq |2 - x|$$

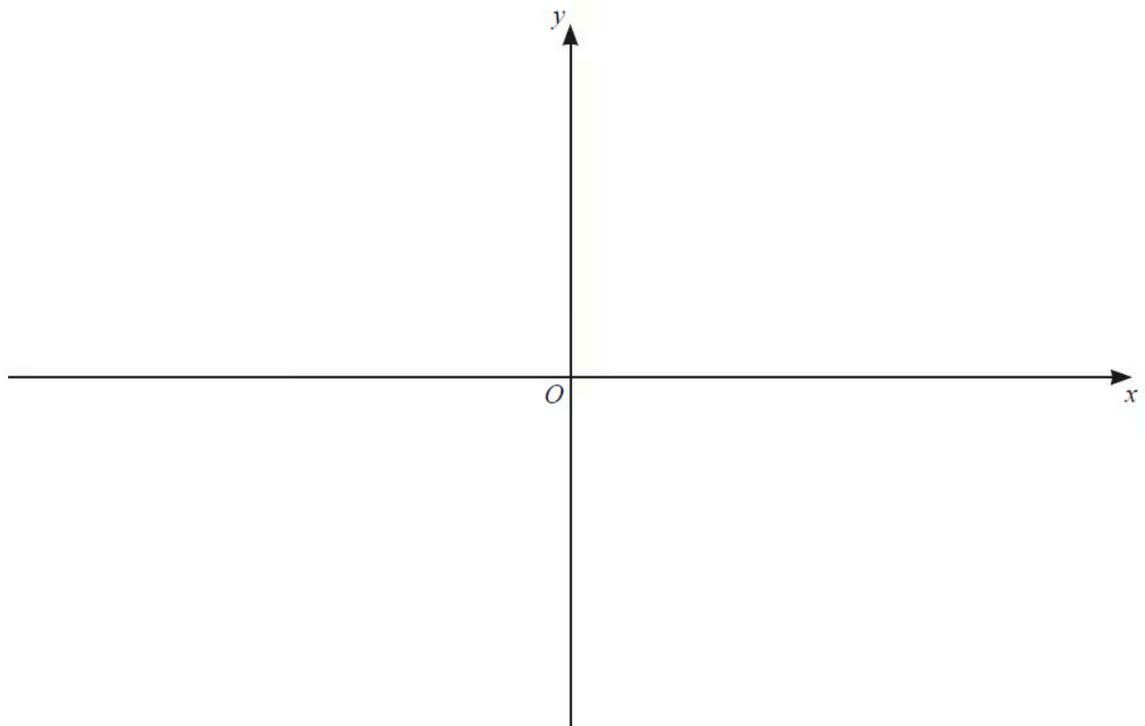
(4 marks)

Hard Questions

1 Solve the inequality $|4x - 1| > 9$.

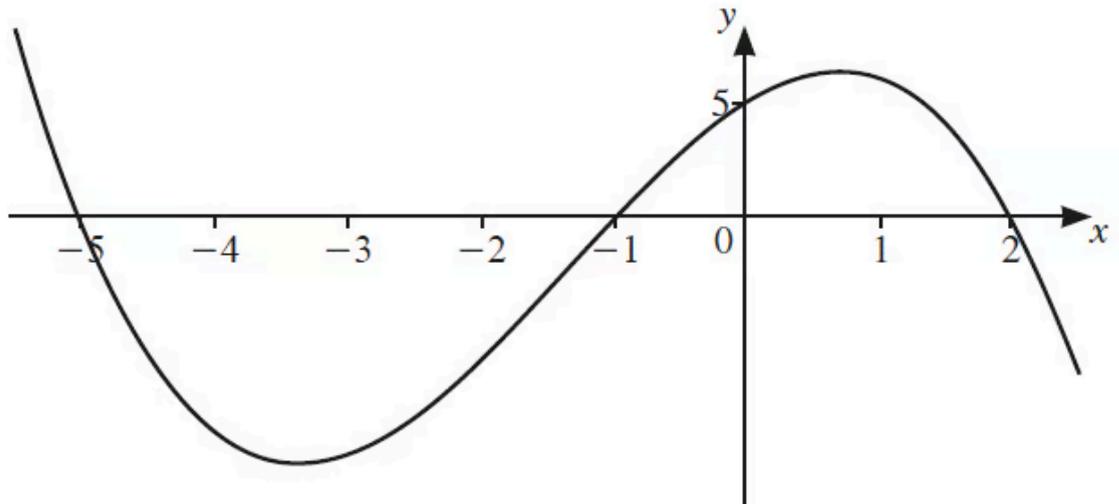
(3 marks)

2 On the axes below, sketch the graph of $y = |(x - 2)(x + 1)(x + 2)|$ showing the coordinates of the points where the curve meets the axes.



(3 marks)

3 (a)



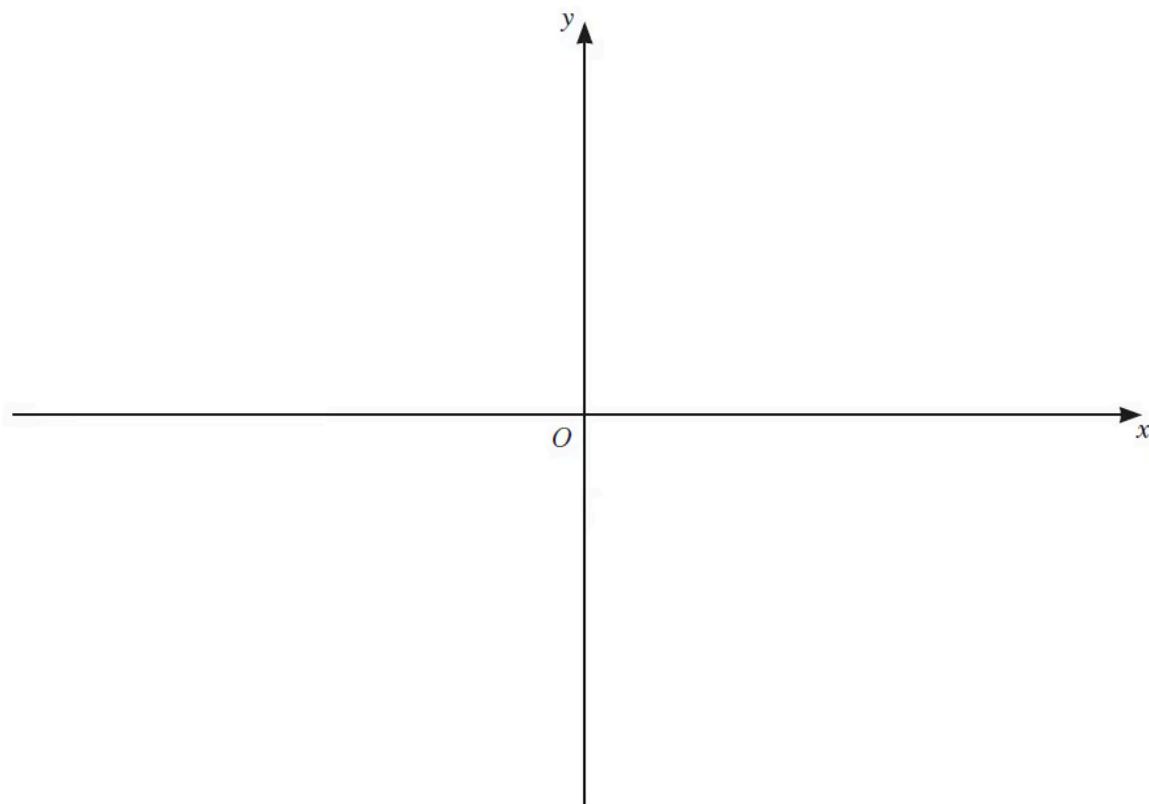
The diagram shows the graph of $y = f(x)$, where $f(x)$ is a cubic polynomial. Find $f(x)$.

(3 marks)

(b) Write down the values of x such that $f(x) < 0$.

(2 marks)

- 4 (a) On the axes below, sketch the graph of $y = (x - 2)(x + 1)(3 - x)$, stating the intercepts on the coordinate axes.



(3 marks)

- (b) Hence write down the values of x such that $(x - 2)(x + 1)(3 - x) > 0$.

(2 marks)

5 Solve $|3x - 2| = 4 + x$.

(1 mark)

- 6 (a) The graph $y = p(x)$ where $p(x) = 5x^3 - 17x^2 + 16x + a$ intersects the x -axis at the points $(b, 0)$, $(1, 0)$ and $(c, 0)$ where $b < c$.

Find the constants a , b and c .

(5 marks)

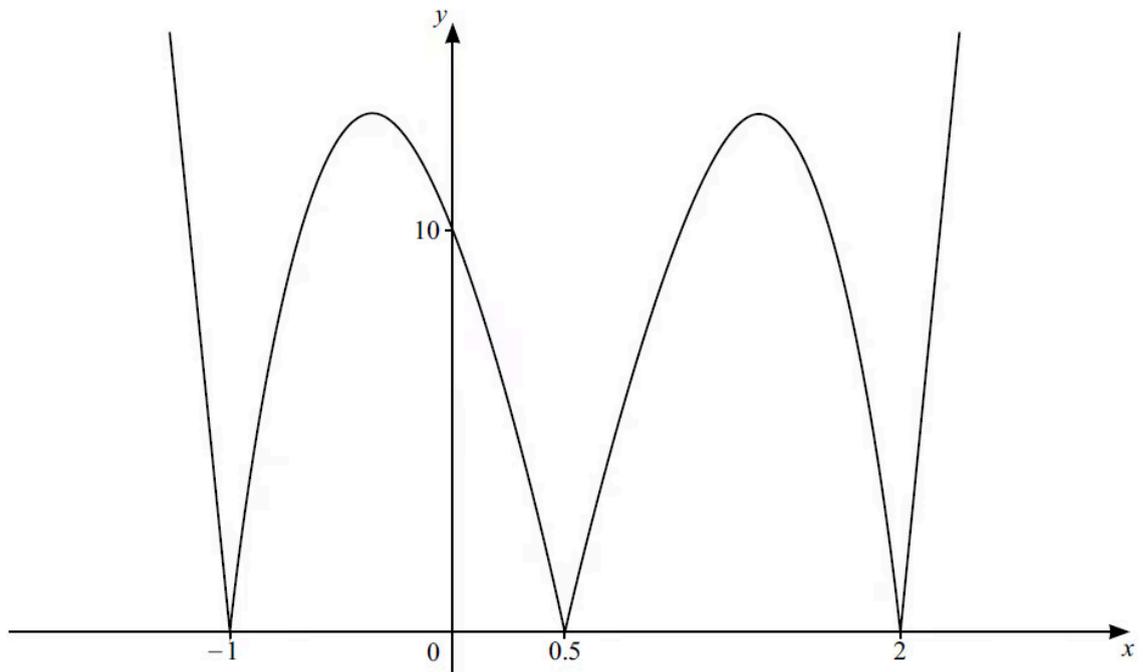
- (b) The curve $y = p(x)$ has a local maximum point at $\left(\frac{2}{3}, \frac{16}{27}\right)$ and a local minimum point at $\left(\frac{8}{5}, -\frac{36}{25}\right)$.

Find the value of d for which the equation $|p(x)| = d$ has exactly 5 distinct solutions.

(2 marks)

Very Hard Questions

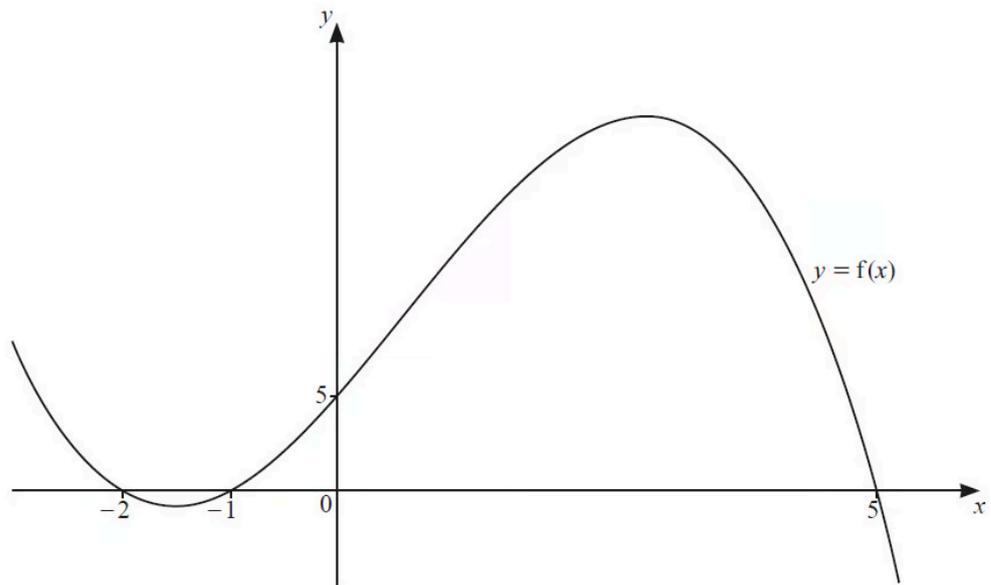
1



The diagram shows the graph of $y = |f(x)|$, where $f(x)$ is a cubic function. Find the possible expressions for $f(x)$ in factorised form.

(3 marks)

2 (a) The diagram shows the graph of a cubic curve .



Find an expression for $f(x)$.

(2 marks)

(b) Solve $f(x) \leq 0$.

(2 marks)

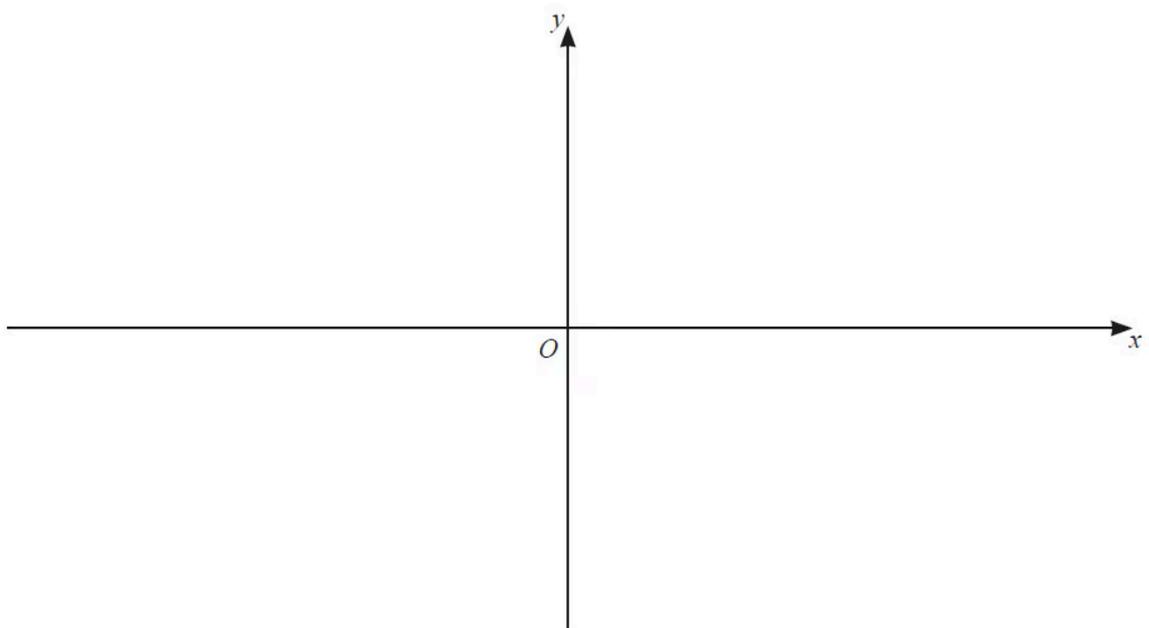
3 (a) Write $2x^2 + 3x - 4$ in the form $a(x + b)^2 + c$, where a , b and c are constants.

(3 marks)

(b) Hence write down the coordinates of the stationary point on the curve $y = 2x^2 + 3x - 4$.

(2 marks)

(c) On the axes below, sketch the graph of $y = |2x^2 + 3x - 4|$, showing the exact values of the intercepts of the curve with the coordinate axes.

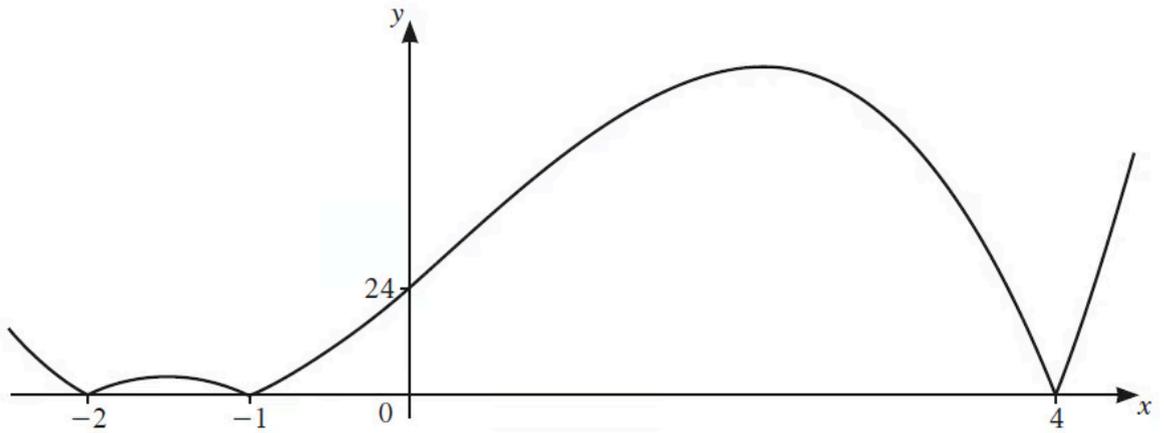


(3 marks)

(d) Find the value of k for which $|2x^2 + 3x - 4| = k$ has exactly 3 values of x .

(1 mark)

4



The diagram shows the graph of $y = |p(x)|$, where $p(x)$ is a cubic function. Find the two possible expressions for $p(x)$.

(3 marks)

5 Solve the inequality $|3x + 2| > 8 + x$.

(3 marks)