

Functions

A-level Pure Mathematics (Year 2) | Edexcel 9MA0 | 12 questions, 83 marks

A-level Maths topic practice



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Name: _____ Date: _____ Score: _____ / 83

- 1 The functions f and g are defined by

$$f(x) = 3x - 5, x \in \mathbb{R}$$

$$g(x) = x^2 + 1, x \in \mathbb{R}$$

- Find $fg(2)$
- Find $gf(x)$, giving your answer in the form $ax^2 + bx + c$

(4 marks)

Answer _____

- 2 The function f is defined by

$$f(x) = \frac{2x + 3}{x - 1}, x > 1$$

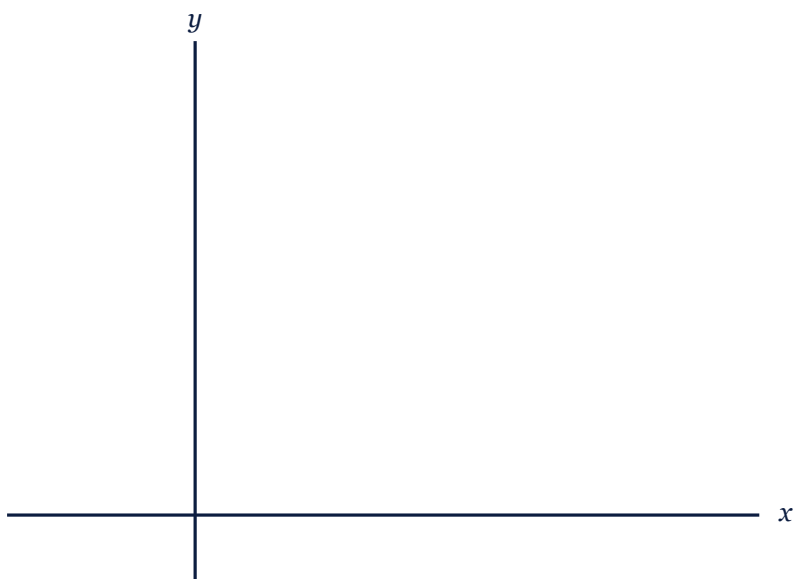
- Find $f^{-1}(x)$
- State the domain of f^{-1}

(4 marks)

Answer _____

3

- a. Sketch the graph of $y = |3x - 6|$, showing the coordinates of any points where the graph meets the coordinate axes.
- b. Solve the equation $|3x - 6| = 9$



(5 marks)

Answer

4

The function f is defined by

$$f(x) = x^2 - 6x + 11, x \geq 3$$

- Find the range of f .
- Find $f^{-1}(x)$, stating its domain.
- Solve the equation $f(x) = f^{-1}(x)$, giving your answer in the form $\frac{a + \sqrt{b}}{2}$

(7 marks)

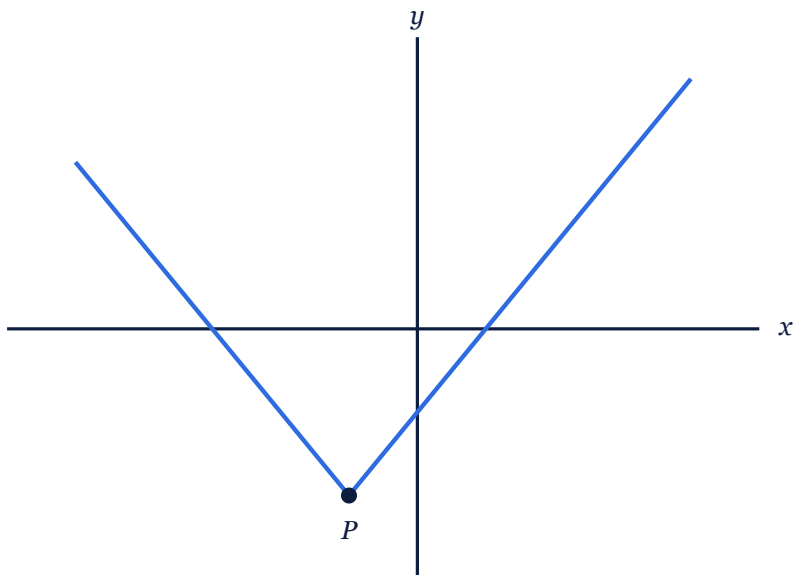
Answer _____

5

The diagram shows a sketch of the graph with equation $y = 2|x + 1| - 4$

The vertex of the graph is the point P.

- Find the coordinates of P.
- Find the coordinates of the points where the graph meets the x -axis.
- Solve the equation $2|x + 1| - 4 = \frac{1}{2}x + 1$
- Find the set of values of the constant k for which the equation $2|x + 1| - 4 = k$ has exactly two solutions.



(8 marks)

Answer _____

6 The functions f and g are defined by

$$f(x) = e^{2x} - 3, x \in \mathbb{R}$$

$$g(x) = \ln(x + 4), x > -4$$

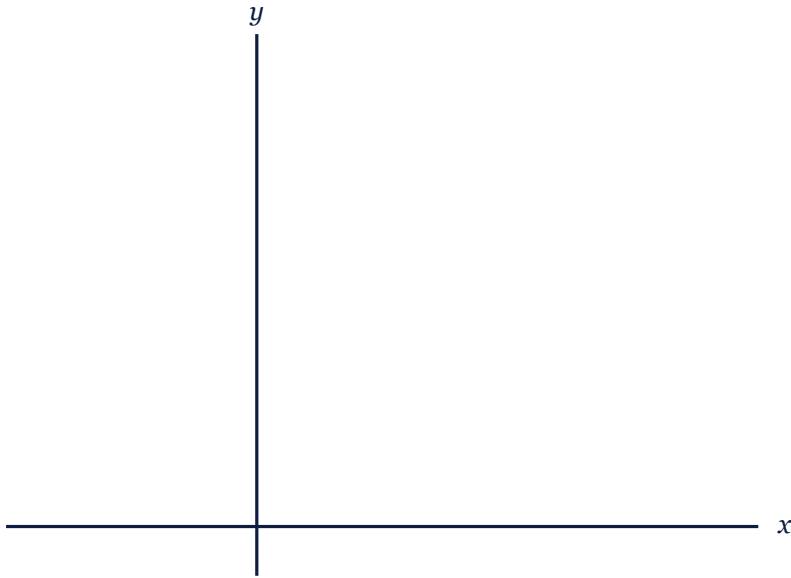
- State the range of f .
- Find $f^{-1}(x)$, stating its domain.
- Find $gf(x)$, giving your answer in its simplest form.
- Solve $gf(x) = 2$, giving your answer in the form $\frac{1}{2} \ln a$, where a is an exact value to be found.

(7 marks)

Answer _____

7

- a. On the same axes, sketch the graphs of $y = |2x - 5|$ and $y = |x + 1|$, showing the coordinates of the points where each graph meets the coordinate axes.
- b. Solve the inequality $|2x - 5| > |x + 1|$



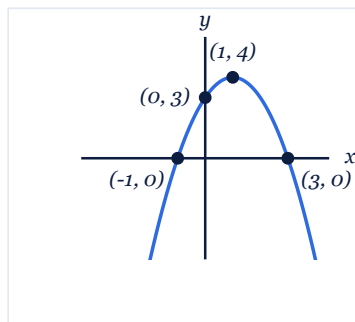
(7 marks)

Answer

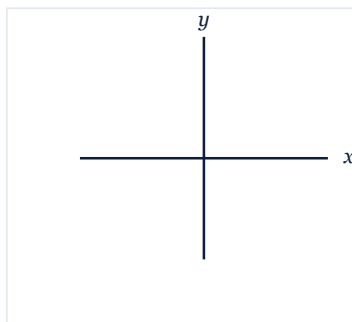
8

The diagram shows a sketch of the curve with equation $y = f(x)$. The curve meets the x -axis at $(-1, 0)$ and $(3, 0)$, meets the y -axis at $(0, 3)$ and has a maximum point at $(1, 4)$.

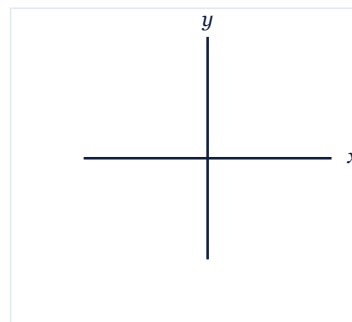
- Sketch the curve with equation $y = |f(x)|$, showing the coordinates of the points where it meets the axes and of the maximum point.
- Sketch the curve with equation $y = f(|x|)$, showing the coordinates of the points where it meets the axes and of any maximum points.
- Find the set of values of k for which $f(|x|) = k$ has exactly four solutions.
- State the coordinates of the maximum point of the curve with equation $y = 2f(x + 1)$



$y = f(x)$



(a) $y = |f(x)|$



(b) $y = f(|x|)$

(8 marks)

Answer

9 The function h is defined by

$$h(x) = 5 + 8x - 2x^2, x \in \mathbb{R}$$

- Explain why h does not have an inverse.
- Write $h(x)$ in the form $p - q(x - s)^2$, where p , q and s are constants.

The function g is defined by $g(x) = 5 + 8x - 2x^2, x \leq k$

- State the largest value of k for which g has an inverse.
- Using this value of k , find $g^{-1}(x)$, stating its domain.

(7 marks)

Answer _____

10 The functions f and g are defined by

$$f(x) = 2x + 3, x \in \mathbb{R}$$

$$g(x) = \frac{6}{x+1}, x > -1$$

- Show that $gf(x) = \frac{3}{x+2}$
- Explain why $gf(x)$ is only defined for $x > -2$, and state the range of gf .
- Show that the equation $fg(x) = gf(x)$ has no solutions.

(8 marks)

Answer _____

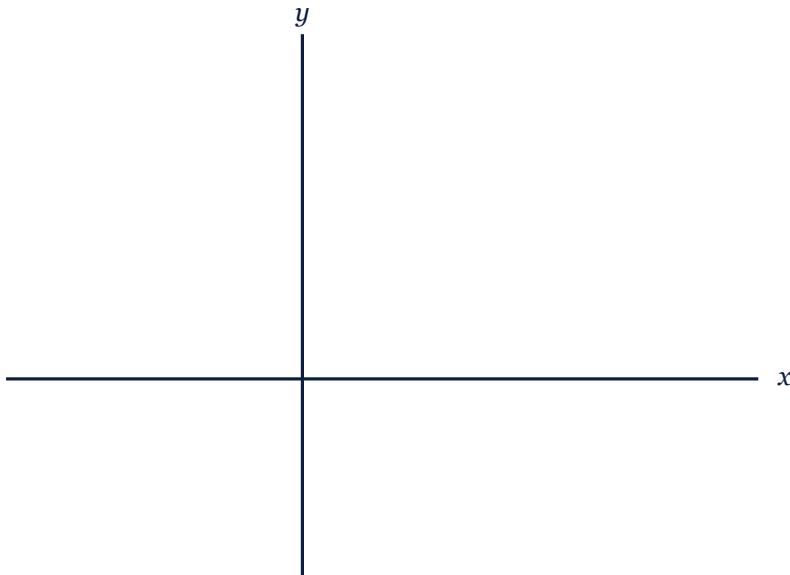
11

The function f is defined by

$$f(x) = 2k - |x - k|, \quad x \in \mathbb{R}$$

where k is a positive constant.

- Sketch the graph of $y = f(x)$, stating, in terms of k , the coordinates of the maximum point and of the points where the graph meets the coordinate axes.
- Solve, in terms of k , the equation $f(x) = \frac{1}{2}x$
- Hence find, in terms of k , the set of values of x for which $f(x) > \frac{1}{2}x$



(9 marks)

Answer

- 12 Mia makes a cup of coffee. Its temperature, T °C, t minutes after it is made is modelled by

$$T = f(t) = 20 + 70e^{-0.04t}, t \geq 0$$

- State the range of f .
- Find $f^{-1}(T)$, stating its domain, and find the value of $f^{-1}(50)$, explaining what it means in this context.

A temperature of T °C is F °F where $F = g(T) = 1.8T + 32$

- Find $gf(t)$ in its simplest form, and hence find the time at which the coffee is at 140 °F.

(9 marks)

Answer

End of questions | Total 83 marks