Modulus function

Solve $|5x - 2| = -\frac{1}{4}x + 8$. **(4 marks)**

a On the same set of axes, sketch $y = |12 - 5x|$ and $y = -2x + 3$. **(3 marks)**

b State with a reason whether there are any solutions to the equation $|12 - 5x| = -2x + 3$ **(2 marks)**

The function f is defined by

$$f : x \to |3x - a|, \ x \in \mathbb{R}.$$

where a is a positive constant.

a Find ff$(-2a)$. **(2)**

b Sketch the graph $y = f(x)$, showing the coordinates of any points where the graph meets the coordinate axes. **(3)**

c Solve the equation $f(x) = x$, giving your answers in terms of a. **(3)**

a Sketch on the same set of axes the graphs of $y = |x|$ and $y = |2x - 3|$. **(3)**

b Hence, or otherwise, solve the equation

$$|x| = |2x - 3|. \quad \textbf{(4)}$$

(a) Sketch and label on the same set of axes the graphs of:

(i) $y = |x|$; *(1 mark)*

(ii) $y = |2x - 4|$. *(2 marks)*

(b) (i) Solve the equation $|x| = |2x - 4|$. *(3 marks)*

(ii) Hence, or otherwise, solve the inequality $|x| > |2x - 4|$. *(2 marks)*

(a) Sketch the graph of $y = |2x|$. *(1 mark)*

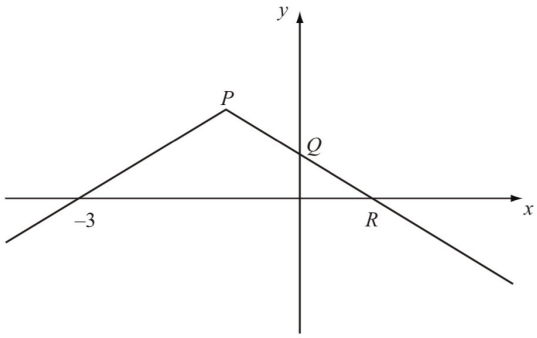
(b) On a separate diagram, sketch the graph of $y = 4 - |2x|$, indicating the coordinates of the points where the graph crosses the coordinate axes. *(3 marks)*

(c) Solve $4 - |2x| = x$. *(3 marks)*

(d) Hence, or otherwise, solve the inequality $4 - |2x| > x$. *(2 marks)*

The equation $|2x - 11| = \frac{1}{2}x + k$ has exactly two distinct solutions.

Find the range of possible values of k. **(4 marks)**



The diagram above shows the graph of $y = f(x),\ x \in \Re$.
The graph consists of two line segments that meet at the point P.
The graph cuts the y-axis at the point Q and the x-axis at the points $(-3, 0)$ and R.

Sketch, on separate diagrams, the graphs of

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

(2)

(b) $y = f(-x)$.

(2)

Given that $f(x) = 2 - |x + 1|$,

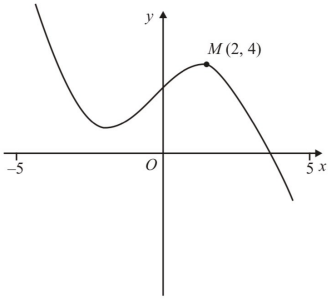
(c) find the coordinates of the points P, Q and R,

(3)

(d) solve $f(x) = \frac{1}{2}x$.

(5)
(Total 12 marks)

Functions: transformations and inverses



The figure above shows the graph of $y = f(x)$, $-5 \leq x \leq 5$.
The point $M\,(2, 4)$ is the maximum turning point of the graph.

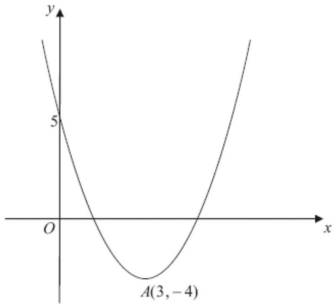
Sketch, on separate diagrams, the graphs of

(a) $y = f(x) + 3$,

(2)

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

(2)



The diagram above shows a sketch of the curve with the equation $y = f(x)$, $x \in \mathbb{R}$.

The curve has a turning point at $A(3, -4)$ and also passes through the point $(0, 5)$.

(a) Write down the coordinates of the point to which A is transformed on the curve with equation

(i) $y = |f(x)|$,

(ii) $y = 2f\left(\frac{1}{2}x\right)$.

(4)

(b) Sketch the curve with equation

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

(3)

On your sketch show the coordinates of all turning points and the coordinates of the point at which the curve cuts the y-axis.

The curve with equation $y = f(x)$ is a translation of the curve with equation $y = x^2$.

(c) Find $f(x)$.

(2)

(d) Explain why the function f does not have an inverse.

(1)

(Total 10 marks)