7. [Maximum mark: 8]

Let $f(x) = kx^2 + kx$ and $g(x) = x - 0.8$. The graphs of f and g intersect at two distinct points. Find the possible values of k.

*Do **NOT** write solutions on this page.*

9. *[Maximum mark: 15]*

Consider the function $f(x) = x^2 - 4x + 1$.

(a) Sketch the graph of f, for $-1 \le x \le 5$. *[4 marks]*

This function can also be written as $f(x) = (x - p)^2 - 3$.

(b) Write down the value of p. *[1 mark]*

The graph of g is obtained by reflecting the graph of f in the x-axis, followed by a translation of $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$.

(c) Show that $g(x) = -x^2 + 4x + 5$. *[4 marks]*

The graphs of f and g intersect at two points.

(d) Write down the x-coordinates of these two points. *[3 marks]*

Let R be the region enclosed by the graphs of f and g.

(e) Find the area of R. *[3 marks]*

Turn over

2. *[Maximum mark: 7]*

Let $f(x) = 2x^2 - 8x - 9$.

(a) (i) Write down the coordinates of the vertex.

(ii) Hence or otherwise, express the function in the form $f(x) = 2(x-h)^2 + k$. *[4 marks]*

(b) Solve the equation $f(x) = 0$. *[3 marks]*

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*Do **NOT** write solutions on this page.*

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Consider the function $f(x) = x^2 - 4x + 1$.

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The graph of g is obtained by reflecting the graph of f in the x-axis, followed by a translation of $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$.

(c) Show that $g(x) = -x^2 + 4x + 5$. *[4 marks]*

The graphs of f and g intersect at two points.

(d) Write down the x-coordinates of these two points. *[3 marks]*

Let R be the region enclosed by the graphs of f and g.

(e) Find the area of R. *[3 marks]*

Turn over

7. *[Maximum mark: 7]*

Let $f(t) = 2t^2 + 7$, where $t > 0$. The function v is obtained when the graph of f is transformed by

> a stretch by a scale factor of $\dfrac{1}{3}$ parallel to the y-axis,
>
> followed by a translation by the vector $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$.

(a) Find $v(t)$, giving your answer in the form $a(t-b)^2 + c$. *[4 marks]*

(b) A particle moves along a straight line so that its velocity in m s^{-1}, at time t seconds, is given by v. Find the distance the particle travels between $t = 5.0$ and $t = 6.8$. *[3 marks]*

2. *[Maximum mark: 6]*

Let $f(x) = 3x^2$. The graph of f is translated 1 unit to the right and 2 units down.
The graph of g is the image of the graph of f after this translation.

(a)　Write down the coordinates of the vertex of the graph of g.　　　*[2 marks]*

(b)　Express g in the form $g(x) = 3(x-p)^2 + q$.　　　*[2 marks]*

The graph of h is the reflection of the graph of g in the x-axis.

(c)　Write down the coordinates of the vertex of the graph of h.　　　*[2 marks]*

Turn over