Functions- Edexcel Past Exam Questions

1. The function f is defined by

$$f: x \mapsto \frac{5x+1}{x^2+x-2} - \frac{3}{x+2}, \quad x > 1.$$

(*a*) Show that $f(x) = \frac{2}{x-1}, \quad x > 1.$ **(4)**

(*b*) Find $f^{-1}(x)$. **(3)**

The function g is defined by

$$g: x \mapsto x^2 + 5, \quad x \in \mathbb{R}.$$

(*c*) Solve $fg(x) = \frac{1}{4}$. **(3)**

June 05 Q3

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2. The functions f and g are defined by

$$f: x \mapsto 2x + \ln 2, \quad x \in \mathbb{R},$$

$$g: x \mapsto e^{2x}, \quad x \in \mathbb{R}.$$

(*a*) Prove that the composite function gf is

$$gf: x \mapsto 4e^{4x}, \quad x \in \mathbb{R}.$$

(4)

(*b*) Sketch the curve with equation $y = gf(x)$, and show the coordinates of the point where the curve cuts the y-axis. **(1)**

(*c*) Write down the range of gf. **(1)**

Jan 06 Q8*(edited)*

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3. For the constant k, where $k > 1$, the functions f and g are defined by

$$\mathrm{f}: x \mapsto \ln(x + k), \quad x > -k,$$

$$\mathrm{g}: x \mapsto |2x - k|, \quad x \in \mathbb{R}.$$

(*a*) On separate axes, sketch the graph of f and the graph of g.
On each sketch state, in terms of k, the coordinates of points where the graph meets the coordinate axes. **(5)**

(*b*) Write down the range of f. **(1)**

(*c*) Find $\mathrm{fg}\left(\frac{k}{4}\right)$ in terms of k, giving your answer in its simplest form. **(2)**

June 06 Q7 *(edited)*

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4. The function f is defined by

$$\mathrm{f}: x \mapsto \ln(4 - 2x), \quad x < 2 \text{ and } x \in \mathbb{R}.$$

(*a*) Show that the inverse function of f is defined by

$$\mathrm{f}^{-1}: x \mapsto 2 - \tfrac{1}{2}\mathrm{e}^{x}$$

and write down the domain of f^{-1}.

(4)

(*b*) Write down the range of f^{-1}.

(1)

(*c*) Sketch the graph of $y = \mathrm{f}^{-1}(x)$. State the coordinates of the points of intersection with the x and y axes.

(4)

Jan 07 Q6*(edited)*

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5. The functions f and g are defined by

$$\mathrm{f} : \mapsto \ln(2x-1), \qquad x \in \mathbb{R},\ \ x > \tfrac{1}{2},$$

$$\mathrm{g} : \mapsto \frac{2}{x-3}, \qquad x \in \mathbb{R},\ \ x \neq 3.$$

(*a*) Find the exact value of fg(4). **(2)**

(*b*) Find the inverse function $\mathrm{f}^{-1}(x)$, stating its domain. **(4)**

(*c*) Sketch the graph of $y = |\mathrm{g}(x)|$. Indicate clearly the equation of the vertical asymptote and the coordinates of the point at which the graph crosses the *y*-axis. **(3)**

(*d*) Find the exact values of x for which $\left|\frac{2}{x-3}\right| = 3$. **(3)**

June 07 Q5

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6. The functions f and g are defined by

$$\mathrm{f} : x \mapsto 1 - 2x^3, \quad x \in \mathbb{R}.$$

$$\mathrm{g} : x \mapsto \frac{3}{x} - 4, \quad x > 0,\ x \in \mathbb{R}.$$

(*a*) Find the inverse function f^{-1}. **(2)**

(*b*) Show that the composite function gf is

$$\mathrm{gf} : x \to \frac{8x^3 - 1}{1 - 2x^3}.$$ **(4)**

(*c*) Solve gf $(x) = 0$. **(2)**

Jan 08 Q8*(edited)*

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7. The function f is defined by

$$\text{f}: x \mapsto \frac{2(x-1)}{x^2-2x-3} - \frac{1}{x-3}, \quad x > 3.$$

(*a*) Show that $\text{f}(x) = \dfrac{1}{x+1}, \quad x > 3.$ **(4)**

(*b*) Find the range of f. **(2)**

(*c*) Find $\text{f}^{-1}(x)$. State the domain of this inverse function. **(3)**

The function g is defined by

$$\text{g}: x \mapsto 2x^2 - 3, \quad x \in \mathbb{R}.$$

(*d*) Solve $\text{fg}(x) = \dfrac{1}{8}$. **(3)**

June 08 Q4

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8. The functions f and g are defined by

$$\text{f}: x \mapsto 3x + \ln x, \quad x > 0, \quad x \in \mathbb{R},$$

$$\text{g}: x \mapsto \text{e}^{x^2}, \quad x \in \mathbb{R}.$$

(*a*) Write down the range of g. **(1)**

(*b*) Show that the composite function fg is defined by

$$\text{fg}: x \mapsto x^2 + 3\text{e}^{x^2}, \quad x \in \mathbb{R}.$$ **(2)**

(*c*) Write down the range of fg. **(1)**

Jan 09 Q5*(edited)*

9.

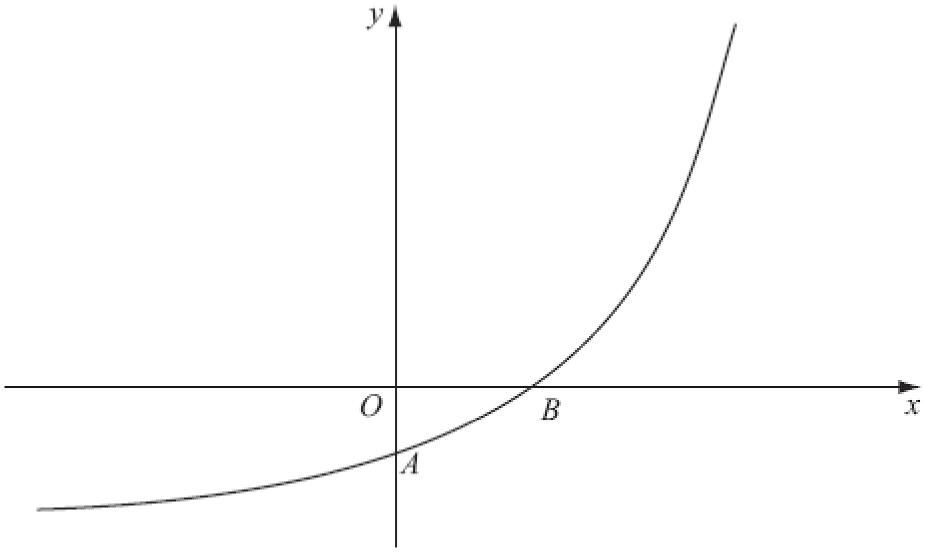

Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = \mathrm{f}(x)$, $x \in \mathbb{R}$.

The curve meets the coordinate axes at the points $A(0, 1 - k)$ and $B(\frac{1}{2}\ln k, 0)$, where k is a constant and $k > 1$, as shown in Figure 2.

On separate diagrams, sketch the curve with equation

(*a*) $y = |\mathrm{f}(x)|$, **(3)**

(*b*) $y = \mathrm{f}^{-1}(x)$. **(2)**

Show on each sketch the coordinates, in terms of k, of each point at which the curve meets or cuts the axes.

Given that $\mathrm{f}(x) = \mathrm{e}^{2x} - k$,

(*c*) state the range of f, **(1)**

(*d*) find $\mathrm{f}^{-1}(x)$, **(3)**

(*e*) write down the domain of f^{-1}. **(1)**

June 09 Q5*(edited)*

10. The functions f and g are defined by

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

$$g(x) = \ln(x - 1), \qquad x \in \mathbb{R}, \quad x > 1.$$

(*a*) Find f^{-1} and state its domain. **(4)**

(*b*) Find fg and state its range. **(3)**

Jan 10 Q9*(edited)*

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11. The function f is defined by

$$f : x \mapsto |2x - 5|, \qquad x \in \mathbb{R}.$$

(*a*) Sketch the graph with equation $y = f(x)$, showing the coordinates of the points where the graph cuts or meets the axes. **(2)**

(*b*) Solve $f(x) = 15 + x$. **(3)**

The function g is defined by

$$g : x \mapsto x^2 - 4x + 1, \qquad x \in \mathbb{R}, \quad 0 \leq x \leq 5.$$

(*c*) Find fg(2). **(2)**

(*d*) Find the range of g. **(3)**

June 10 Q4

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12. The function f is defined by

$$f: x \mapsto \frac{3-2x}{x-5}, \qquad x \in \mathbb{R}, \qquad x \neq 5.$$

(*a*) Find $f^{-1}(x)$. **(3)**

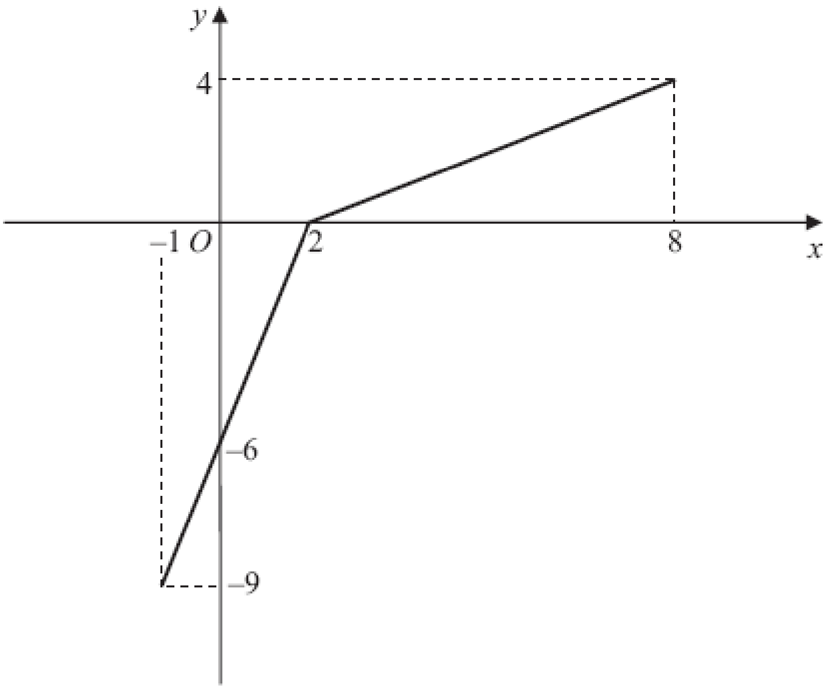

Figure 2

The function g has domain $-1 \leq x \leq 8$, and is linear from $(-1, -9)$ to $(2, 0)$ and from $(2, 0)$ to $(8, 4)$. Figure 2 shows a sketch of the graph of $y = g(x)$.

(*b*) Write down the range of g. **(1)**

(*c*) Find gg(2). **(2)**

(*d*) Find fg(8). **(2)**

(*e*) On separate diagrams, sketch the graph with equation

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

(ii) $y = g^{-1}(x)$.

Show on each sketch the coordinates of each point at which the graph meets or cuts the axes.
(4)

(*f*) State the domain of the inverse function g^{-1}. **(1)**
Jan 11 Q6

13. The function f is defined by

$$\mathrm{f}: x \mapsto 4 - \ln(x + 2), \quad x \in \mathbb{R}, \quad x \geq -1.$$

(*a*) Find $\mathrm{f}^{-1}(x)$. **(3)**

(*b*) Find the domain of f^{-1}. **(1)**

The function g is defined by

$$\mathrm{g}: x \mapsto \mathrm{e}^{x^2} - 2, \quad x \in \mathbb{R}.$$

(*c*) Find fg(x), giving your answer in its simplest form. **(3)**

(*d*) Find the range of fg. **(1)**

June 11 Q4*(edited)*