Functions 2 - Edexcel Past Exam Questions

1. The function f is defined by

$$\mathrm{f}: x \mapsto \frac{3(x+1)}{2x^2+7x-4} - \frac{1}{x+4}, \quad x \in \mathbb{R},\ x > \frac{1}{2}.$$

(*a*) Show that $\mathrm{f}(x) = \dfrac{1}{2x-1}$. **(4)**

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

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

$$\mathrm{g}(x) = \ln(x+1).$$

(*d*) Find the solution of $\mathrm{fg}(x) = \dfrac{1}{7}$, giving your answer in terms of e. **(4)**

Jan 12 Q7

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2. The functions f and g are defined by

$$\mathrm{f}: x \mapsto \mathrm{e}^x + 2, \qquad x \in \mathbb{R},$$

$$\mathrm{g}: x \mapsto \ln x, \qquad x > 0.$$

(*a*) State the range of f. **(1)**

(*b*) Find $\mathrm{fg}(x)$, giving your answer in its simplest form. **(2)**

(*c*) Find the exact value of x for which $\mathrm{f}(2x+3) = 6$. **(4)**

(*d*) Find f^{-1}, the inverse function of f, stating its domain. **(3)**

(*e*) On the same axes sketch the curves with equation $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, giving the coordinates of all the points where the curves cross the axes. **(4)**

June 12 Q6

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3. The function f has domain $-2 \leq x \leq 6$ and is linear from $(-2, 10)$ to $(2, 0)$ and from $(2, 0)$ to $(6, 4)$. A sketch of the graph of $y = \mathrm{f}(x)$ is shown in Figure 1.

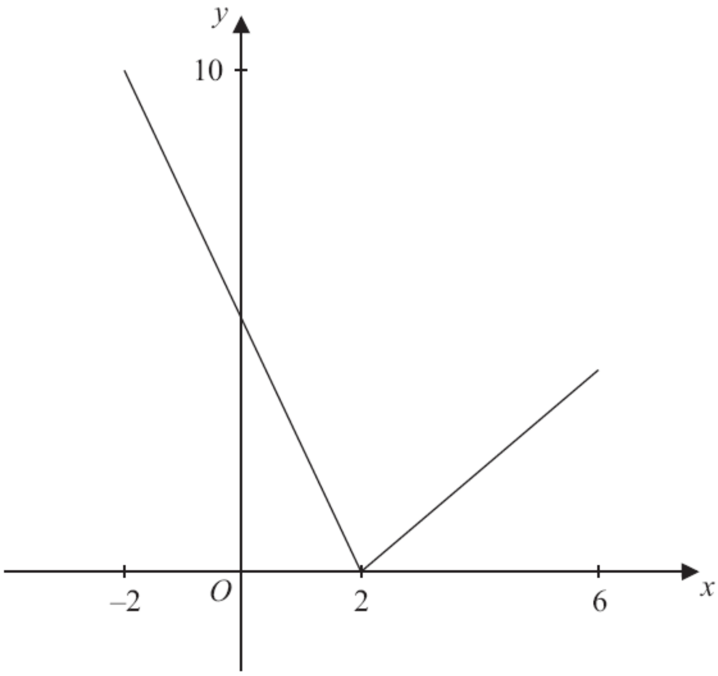

Figure 1

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

(*b*) Find ff(0). **(2)**

The function g is defined by

$$\mathrm{g}: x \rightarrow \frac{4+3x}{5-x}, \qquad x \in \mathbb{R}, \qquad x \neq 5.$$

(*c*) Find $\mathrm{g}^{-1}(x)$. **(3)**

(*d*) Solve the equation $\mathrm{gf}(x) = 16$. **(5)**

June 13 Q7

4. The functions f and g are defined by

$$\mathrm{f}: x \mapsto 2|x| + 3, \qquad x \in R$$

$$\mathrm{g}: x \mapsto 3 - 4x, \qquad x \in R$$

(*a*) State the range of f. **(2)**

(*b*) Find fg(1). **(2)**

(*c*) Find g^{-1}, the inverse function of g. **(2)**

(*d*) Solve the equation

$$\mathrm{gg}(x) + [\mathrm{g}(x)]^2 = 0$$

(5)

June 13(R) Q4

5.

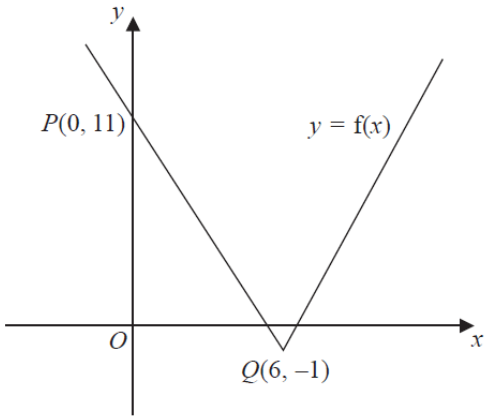

Figure 1

Figure 1 shows part of the graph with equation $y = \mathrm{f}(x)$, $x \in \mathbb{R}$.

The graph consists of two line segments that meet at the point $Q(6, -1)$.

The graph crosses the y-axis at the point $P(0, 11)$.

Sketch, on separate diagrams, the graphs of

(*a*) $y = |\mathrm{f}(x)|$ **(2)**

(*b*) $y = 2\mathrm{f}(-x) + 3$

(3)

On each diagram, show the coordinates of the points corresponding to P and Q.

Given that $\mathrm{f}(x) = a|x - b| - 1$, where a and b are constants,

(*c*) state the value of a and the value of b. **(2)**

June 14 Q4

6. $$g(x) = \frac{x}{x+3} + \frac{3(2x+1)}{x^2+x-6}, \qquad x > 3$$

(*a*) Show that $g(x) = \frac{x+1}{x-2}$, $x > 3$ **(4)**

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

(*c*) Find the exact value of *a* for which $g(a) = g^{-1}(a)$. **(4)**

June 14 Q5

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7. (*a*) Sketch the graph with equation

$$y = |4x - 3|$$

stating the coordinates of any points where the graph cuts or meets the axes. **(2)**

Find the complete set of values of *x* for which

(*b*) $$|4x - 3| > 2 - 2x$$ **(4)**

(*c*) $$|4x - 3| > \frac{3}{2} - 2x$$ **(2)**

June 14(R) Q5

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8. The function f is defined by

$$f: x \to e^{2x} + k^2, \qquad x \in \mathbb{R},, \qquad k \text{ is a positive constant.}$$

(*a*) State the range of f. **(1)**

(*b*) Find f^{-1} and state its domain. **(3)**

The function g is defined by

$$g: x \to \ln(2x), \qquad x > 0$$

(*c*) Solve the equation

$$g(x) + g(x^2) + g(x^3) = 6$$

giving your answer in its simplest form. **(4)**

(*d*) Find fg(x), giving your answer in its simplest form. **(2)**

(*e*) Find, in terms of the constant *k*, the solution of the equation

$$fg(x) = 2k^2$$ **(2)**

June 14(R) Q6

9. The functions f and g are defined by

$$\mathrm{f} : x \rightarrow 7x - 1, \qquad x \in \mathbb{R},$$

$$\mathrm{g} : x \rightarrow \frac{4}{x-2}, \qquad x \neq 2, x \in \mathbb{R},$$

(*a*) Solve the equation $\mathrm{fg}(x) = x$. **(4)**

(*b*) Hence, or otherwise, find the largest value of a such that $\mathrm{g}(a) = \mathrm{f}^{-1}(a)$. **(1)**

June 16 Q1

10.

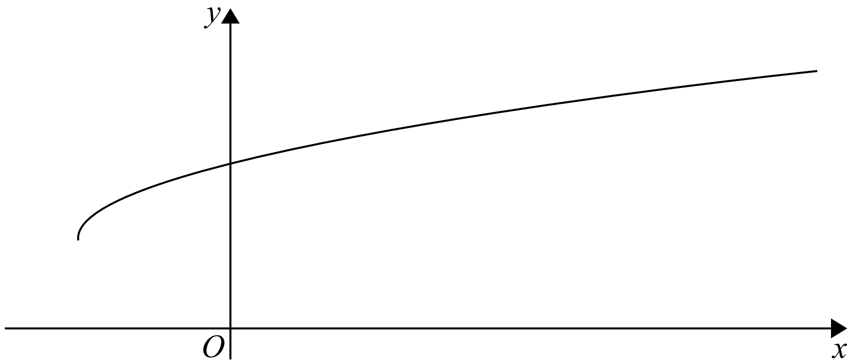

Figure 1

Figure 1 shows a sketch of part of the graph of $y = \mathrm{g}(x)$, where

$$\mathrm{g}(x) = 3 + \sqrt{x+2}, \qquad x \geqslant -2$$

(*a*) State the range of g. **(1)**

(*b*) Find $\mathrm{g}^{-1}(x)$ and state its domain. **(3)**

(*c*) Find the exact value of x for which

$$\mathrm{g}(x) = x$$ **(4)**

(*d*) Hence state the value of a for which

$$\mathrm{g}(a) = \mathrm{g}^{-1}(a)$$ **(1)**

June 17 Q3

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11. Given that a and b are positive constants,

(a) on separate diagrams, sketch the graph with equation

(i) $y = |2x - a|$

(ii) $y = |2x - a| + b$

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

Given that the equation

$$|2x - a| + b = \frac{3}{2}x + 8$$

has a solution at $x = 0$ and a solution at $x = c$,

(b) find c in terms of a. **(4)**

June 17 Q6