Functions Exam Questions (From OCR 4723)

Q1, (June 2005, Q1)

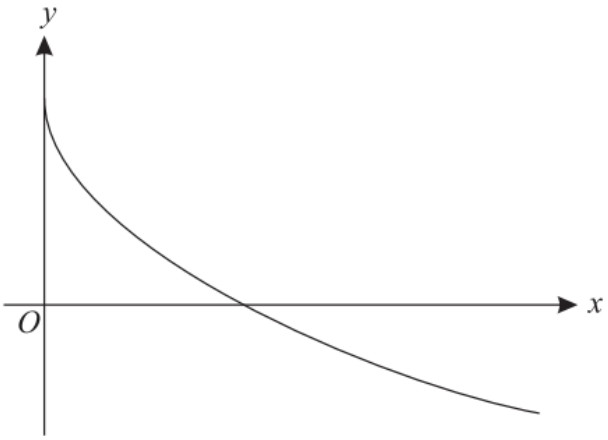
The function f is defined for all real values of x by

$$f(x) = 10 - (x+3)^2.$$

(i) State the range of f. [1]

(ii) Find the value of ff(−1). [3]

Q2, (Jan 2006, Q4)



The function f is defined by $f(x) = 2 - \sqrt{x}$ for $x \geqslant 0$. The graph of $y = f(x)$ is shown above.

(i) State the range of f. [1]

(ii) Find the value of ff(4). [2]

(iii) Given that the equation $|f(x)| = k$ has two distinct roots, determine the possible values of the constant k. [2]

Q3, (Jun 2009, Q5)

The functions f and g are defined for all real values of x by

$$f(x) = 3x - 2 \quad \text{and} \quad g(x) = 3x + 7.$$

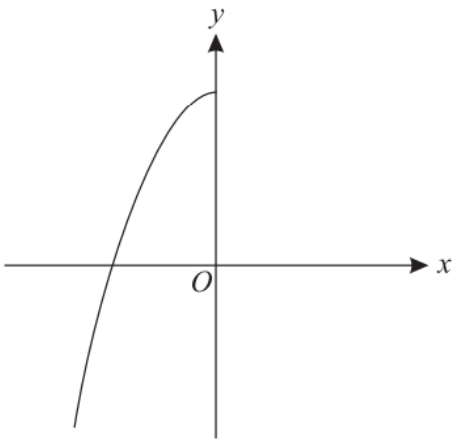
Find the exact coordinates of the point at which

(i) the graph of $y = fg(x)$ meets the x-axis, **[3]**

(ii) the graph of $y = g(x)$ meets the graph of $y = g^{-1}(x)$, **[3]**

(iii) the graph of $y = |f(x)|$ meets the graph of $y = |g(x)|$. **[4]**

Q4, (Jun 2006, Q6)



The diagram shows the graph of $y = f(x)$, where

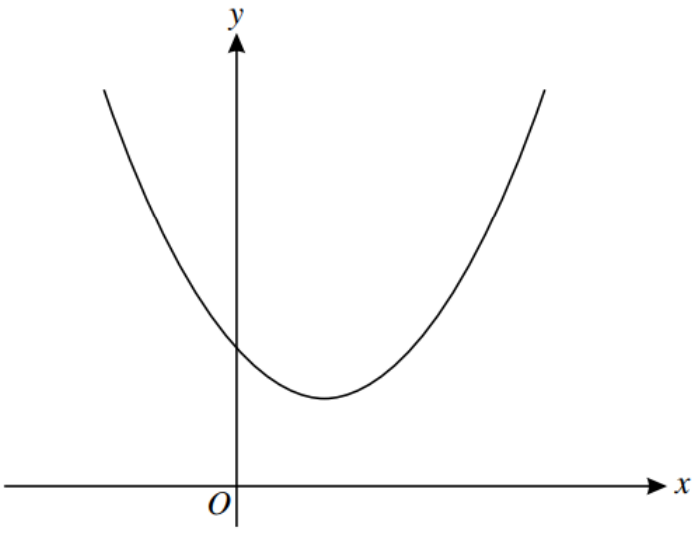
$$f(x) = 2 - x^2, \qquad x \leqslant 0.$$

(i) Evaluate $ff(-3)$. [3]

(ii) Find an expression for $f^{-1}(x)$. [3]

(iii) Sketch the graph of $y = f^{-1}(x)$. Indicate the coordinates of the points where the graph meets the axes. [3]

Q5, (Jan 2011, Q9ii)



The function g is defined for all real values of x by

$$g(x) = e^{2x} + ke^{-2x},$$

where k is a constant greater than 1. The graph of $y = g(x)$ is shown above. Find the range of g, giving your answer in simplified form. **[5]**

Q6, (Jan 2013, Q8)

The functions f and g are defined for all real values of x by

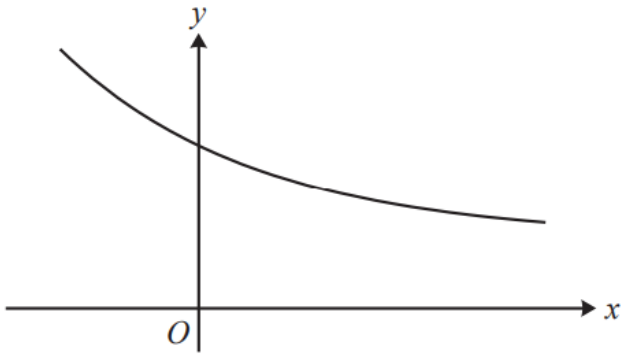
$$f(x) = x^2 + 4ax + a^2 \quad \text{and} \quad g(x) = 4x - 2a,$$

where a is a positive constant.

(i) Find the range of f in terms of a. **[4]**

(ii) Given that $fg(3) = 69$, find the value of a and hence find the value of x such that $g^{-1}(x) = x$. **[6]**

Q7, (Jun 2013, Q7i,ii)



The diagram shows the curve $y = f(x)$, where f is the function defined for all real values of x by

$$f(x) = 3 + 4e^{-x}.$$

(i) State the range of f. **[1]**

(ii) Find an expression for $f^{-1}(x)$, and state the domain and range of f^{-1}. **[4]**

Q8, (Jun 2016, Q8)

The functions f and g are defined for all real values of x by

$$f(x) = |2x + a| + 3a \quad \text{and} \quad g(x) = 5x - 4a,$$

where a is a positive constant.

(i) State the range of f and the range of g. **[2]**

(ii) State why f has no inverse, and find an expression for $g^{-1}(x)$. **[3]**

(iii) Solve for x the equation $gf(x) = 31a$. **[5]**
