9. The function f has domain $(-\infty, \infty)$ and is defined by $f(x) = e^x$.

The function g has domain $(2, \infty)$ and is defined by $g(x) = \ln(x^2 - 4)$.

(a) State the domain of fg. [1]

(b) Solve the equation $fg(x) = 5$. [4]

11. The functions f and g have domains $(0, \infty)$ and $\left(0, \frac{\pi}{4}\right]$ respectively and are defined by

$$f(x) = \ln x,$$
$$g(x) = \tan x.$$

(a) (i) Write down the domain of fg.

(ii) Write down the range of fg. [3]

(b) (i) Solve the equation $fg(x) = -0.4$. Give your answer correct to two decimal places.

(ii) Giving a reason, write down a value for k so that $fg(x) = k$ has no solution. [3]

8. The function f has domain $[-1, \infty)$ and is defined by

$$f(x) = \ln(4x + 5) - 2.$$

(a) Find an expression for $f^{-1}(x)$. [4]

(b) State the domain of f^{-1}. [1]

10. The function f has domain $(-\infty, 10]$ and is defined by

$$f(x) = e^{5 - \frac{x}{2}} + 6.$$

(a) Find an expression for $f^{-1}(x)$. [4]

(b) Write down the domain of f^{-1}. [2]

9. *(a)* The functions f and g have domains $(-\infty, \infty)$ and $(0, \infty)$ respectively and are defined by

$$f(x) = x^2 - 25,$$
$$g(x) = 2x - 3.$$

(i) Write down the domain of fg.

(ii) Write down the range of fg.

(iii) Write down an expression for $fg(x)$.

(iv) Solve the equation $fg(x) = 0$. [7]

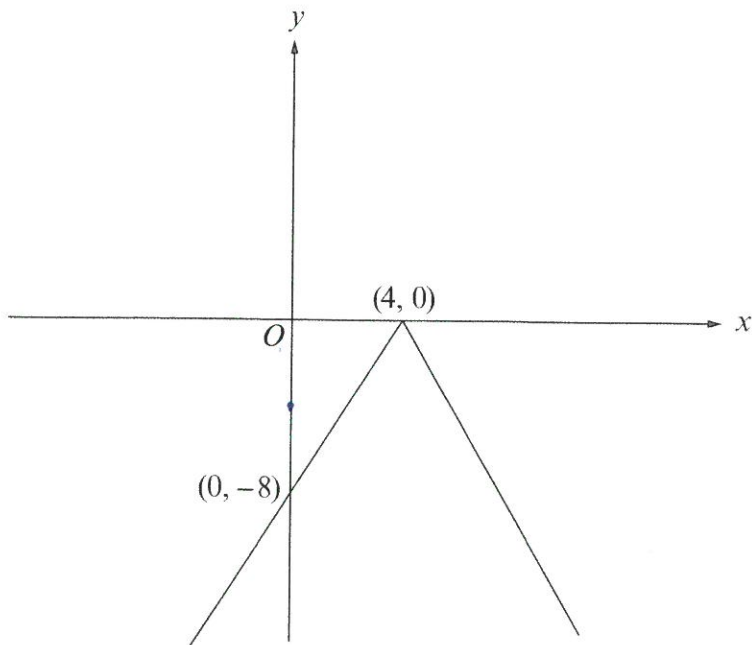*(b)* The function h is defined by

$$h(x) = \frac{2x + 7}{5x - 2}.$$

(i) Show that $hh(x) = x$.

(ii) **Hence** write down an expression for $h^{-1}(x)$. [3]

7. *(a)* Solve the inequality $|3x - 4| > 5$. [3]

(b) (i) Sketch the graph of $y = |x|$.

(ii) The diagram below shows a sketch of the graph of $y = a|x + b|$, where a and b are constants. The graph meets the x-axis at the point $(4, 0)$ and the y-axis at the point $(0, -8)$.
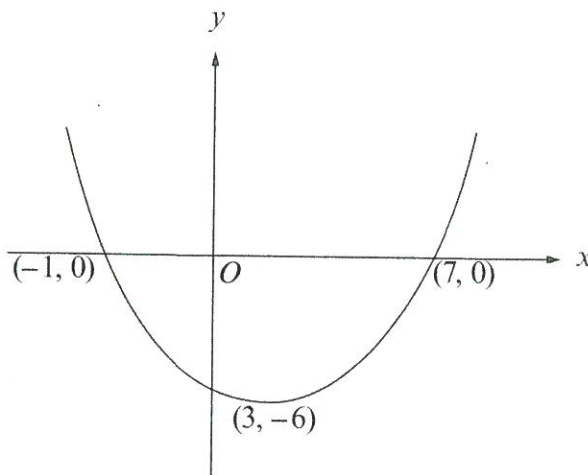

Find the value of a and the value of b. [3]

4

9. The diagram shows a sketch of the graph of $y = f(x)$. The graph passes through the points $(-1, 0)$ and $(7, 0)$ and has a minimum point at $(3, -6)$.

Sketch the graph of $y = -\frac{2}{3}f(x + 4)$, indicating the coordinates of the stationary point and the coordinates of the points of intersection of the graph with the x-axis. [3]