9 The function f is defined by $f(x) = -2x^2 + 9x - 10$ for $0 \leqslant x \leqslant 3$.

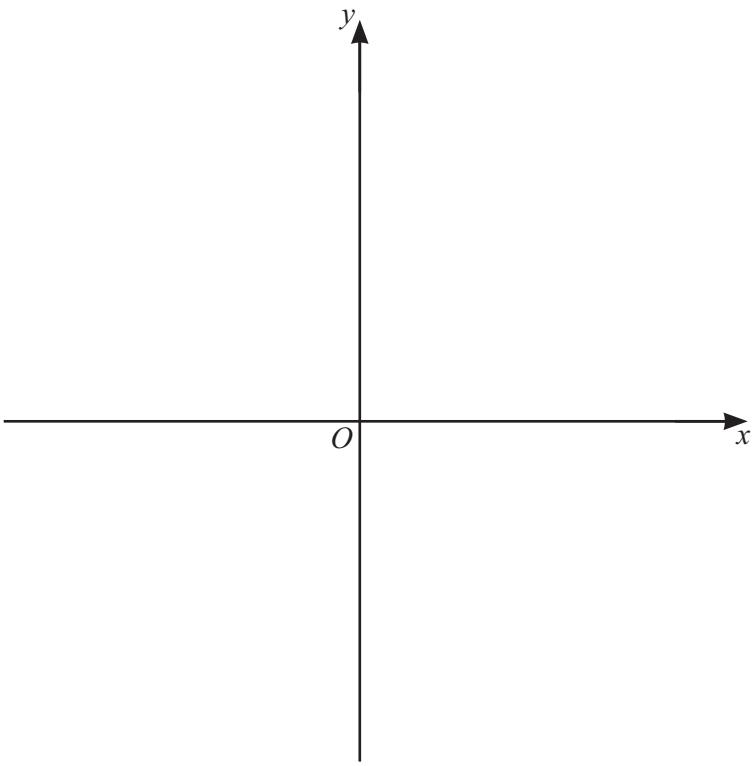
(a) (i) Write $f(x)$ in the form $a + b(x + c)^2$ where a, b and c are constants. [3]

(ii) Hence determine whether or not f^{-1} exists. [2]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

(b) The function g is defined by $g(x) = 3\ln(5-2x)$ for $0 \leqslant x < 2.5$.

(i) On the axes, sketch the graph of $y = g(x)$.
State the exact values of the intercepts with the coordinate axes and the equation of any asymptote. [3]

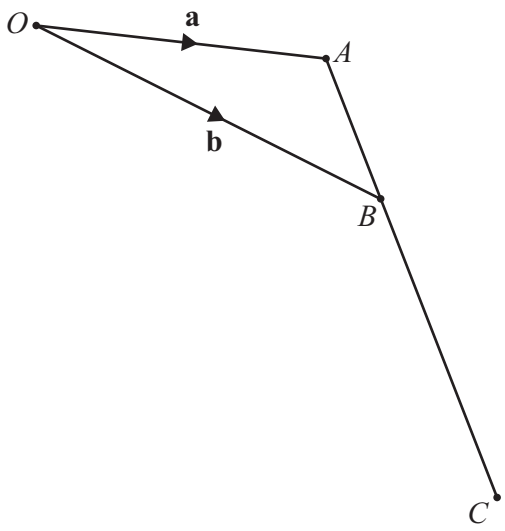


(ii) Find an expression for $g^{-1}(x)$. [2]

(iii) Find the domain and range of g^{-1}.
Give each of your answers in exact form. [2]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN

10



The diagram shows four points, O, A, B and C.

A, B and C lie in a straight line and are such that $\frac{AB}{AC} = \frac{1}{3}$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Find $\overrightarrow{OC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
Simplify your answer. [3]

DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN
DO NOT WRITE IN THIS MARGIN