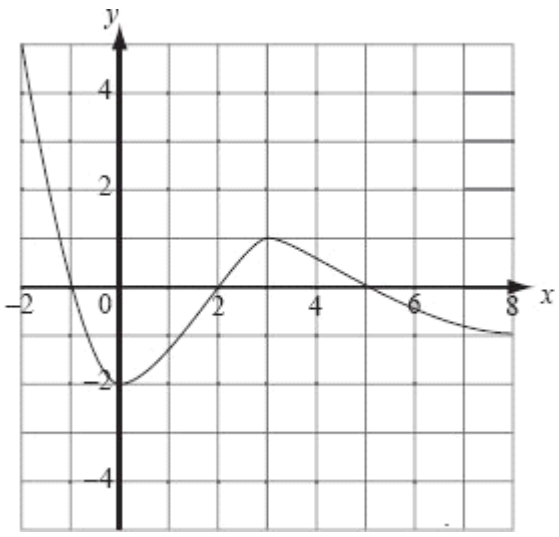
1. (a) Express the quadratic $3x^2 - 6x + 5$ in the form $a(x + b)^2 + c$, where $a, b, c \in \mathbb{Z}$.

(3)

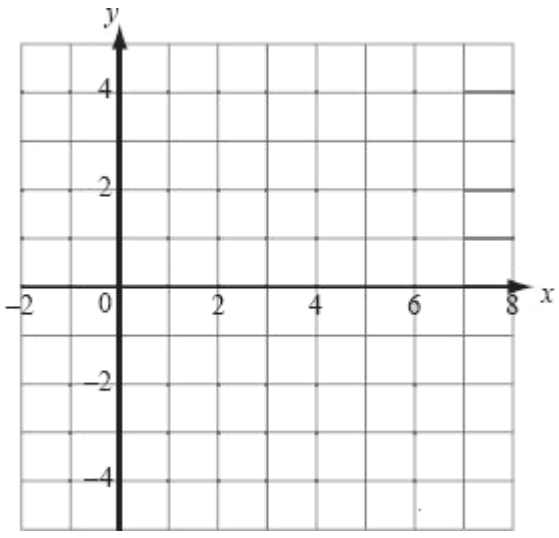
(b) Describe a sequence of transformations that transforms the graph of $y = x^2$ to the graph of $y = 3x^2 - 6x + 5$.

(3)
(Total 6 marks)

2. The graph of $y = f(x)$ for $-2 \leq x \leq 8$ is shown.

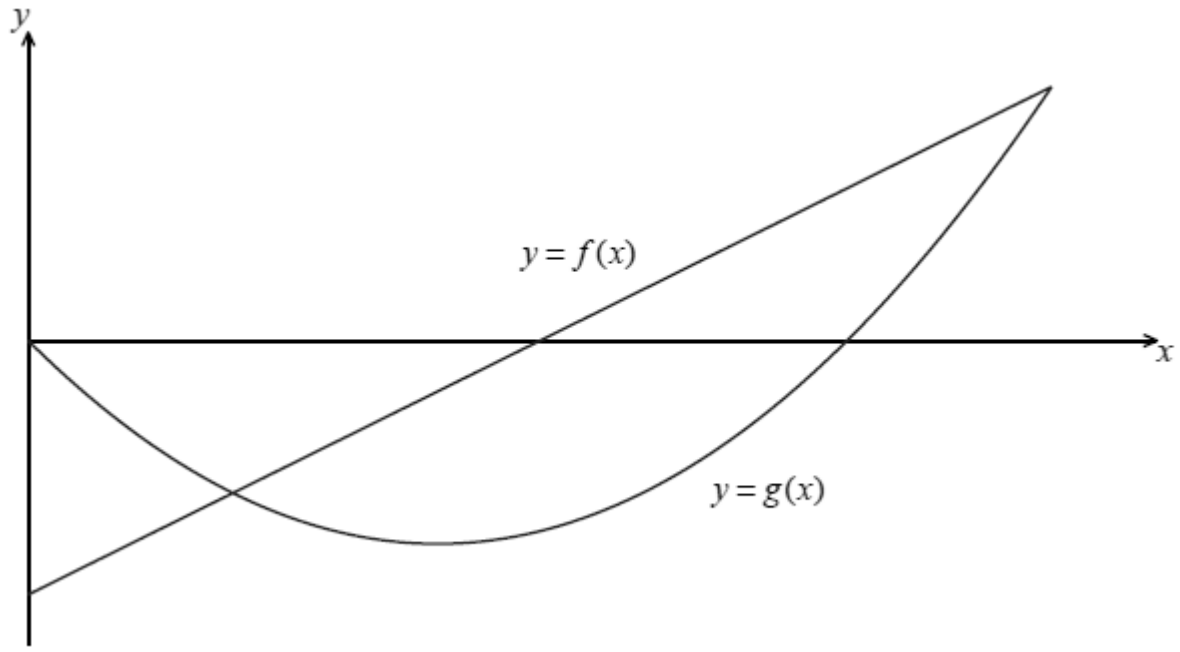


On the set of axes provided, sketch the graph of $y = \frac{1}{f(x)}$, clearly showing any asymptotes and indicating the coordinates of any local maxima or minima.



(Total 5 marks)

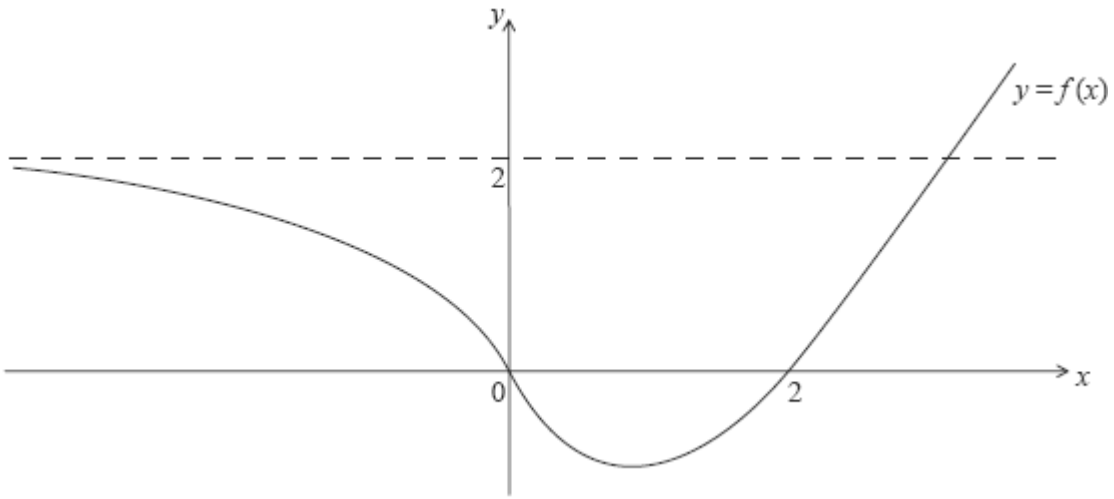
3. The diagram shows the graphs of a linear function f and a quadratic function g.



On the same axes sketch the graph of $\frac{f}{g}$. Indicate clearly where the x-intercept and the asymptotes occur.

(Total 5 marks)

4. The diagram shows the graph of $y = f(x)$. The graph has a horizontal asymptote at $y = 2$.



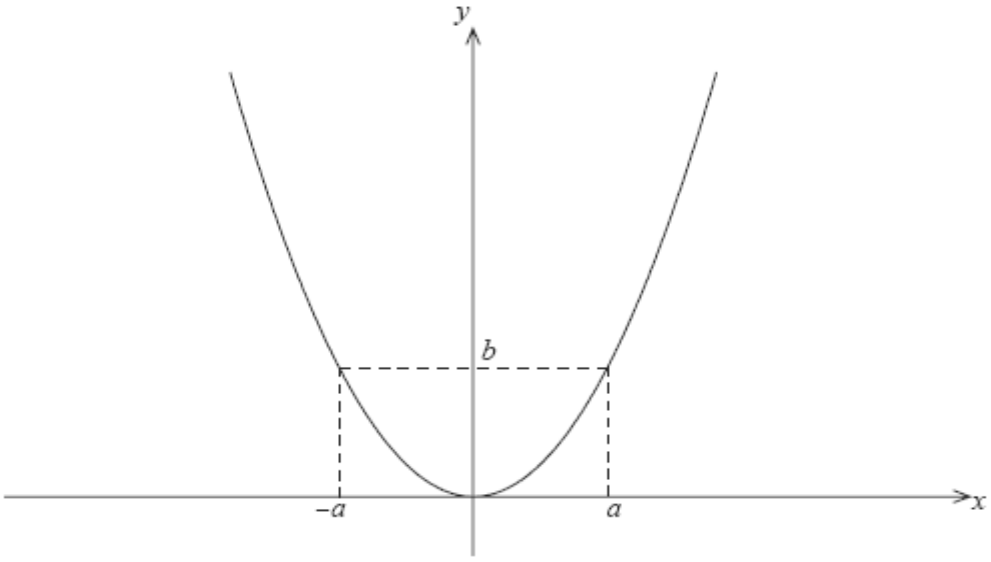
(a) Sketch the graph of $y = \frac{1}{f(x)}$.

(3)

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

(3)
(Total 6 marks)

5. The diagram below shows the graph of the function $y = f(x)$, defined for all $x \in \mathbb{R}$, where $b > a > 0$.

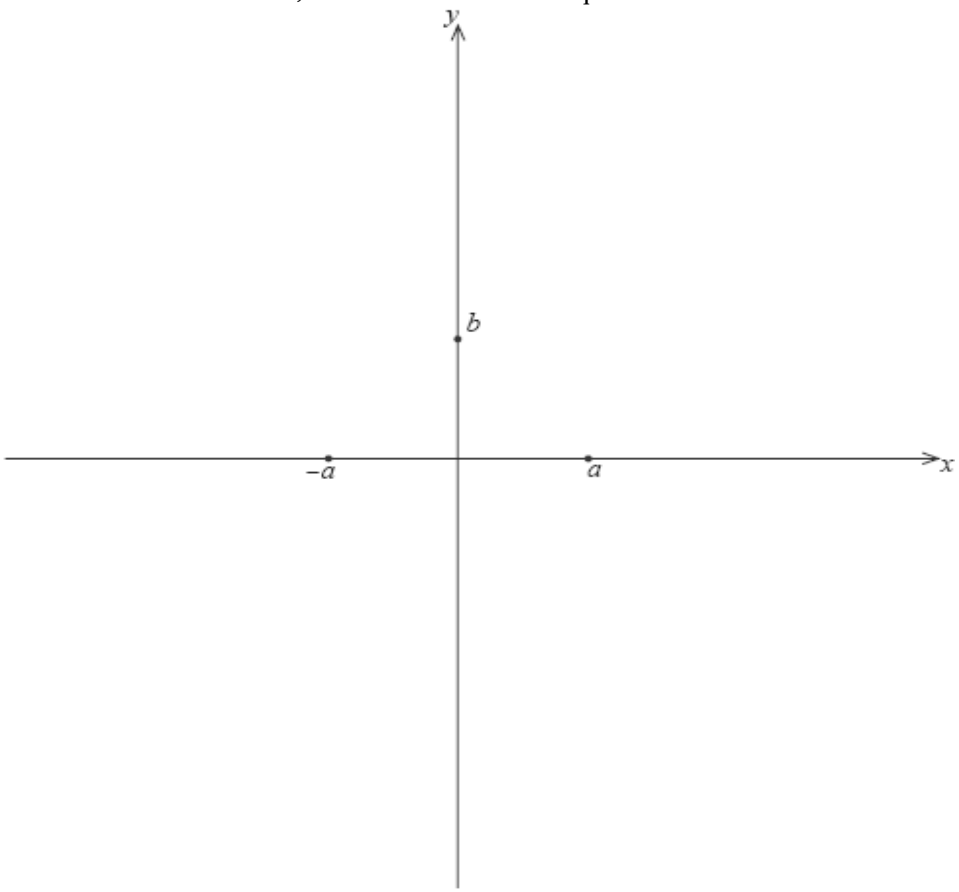


Consider the function $g(x) = \dfrac{1}{f(x-a)-b}$.

(a) Find the largest possible domain of the function g.

(2)

(b) On the axes below, sketch the graph of $y = g(x)$. On the graph, indicate any asymptotes and local maxima or minima, and write down their equations and coordinate



(6)
(Total 8 marks)