12.

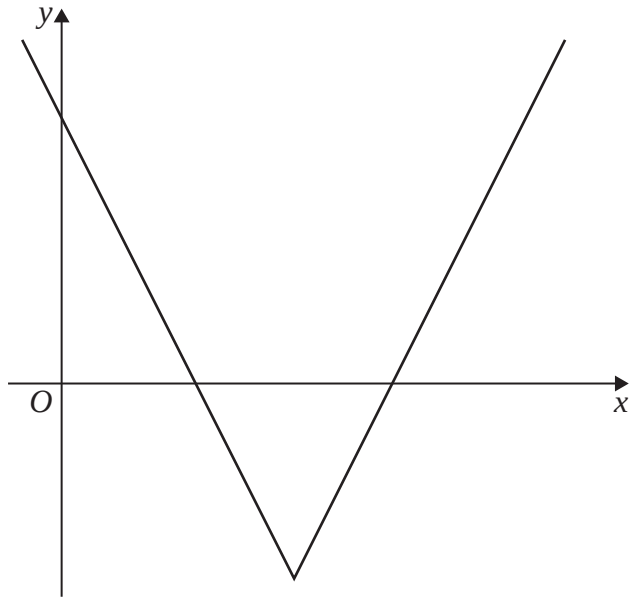

Figure 3

Figure 3 shows a sketch of the graph with equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = 4\left|x - 3\right| - 5 \qquad x \in \mathbb{R}$$

Given that a is a constant and $\left|a\right| = 1$

(a) find the possible values of $\mathrm{f}(a)$

(2)

The function g is defined by

$$\mathrm{g}(x) = 2x + 17 \qquad x \in \mathbb{R}$$

(b) Find the range of $\mathrm{gf}(x)$

(2)

The function h is defined by

$$\mathrm{h}(x) = kx \qquad x \in \mathbb{R}$$

where k is a constant.

Given that the equation $\mathrm{f}(x) = \mathrm{h}(x)$ has no solutions,

(c) find the range of values of k.

(4)