

**8** Functions  $f$  and  $g$  are defined by

$$f : x \mapsto 4x - 2k \quad \text{for } x \in \mathbb{R}, \text{ where } k \text{ is a constant,}$$

$$g : x \mapsto \frac{9}{2-x} \quad \text{for } x \in \mathbb{R}, x \neq 2.$$

**(i)** Find the values of  $k$  for which the equation  $fg(x) = x$  has two equal roots. [4]

**(ii)** Determine the roots of the equation  $fg(x) = x$  for the values of  $k$  found in part **(i)**. [3]