9 The functions f and g are defined by

$$\mathrm{f}(x) = \frac{3x^2}{4x-1} \quad \text{for } x < 0$$
$$\mathrm{g}(x) = \frac{1}{x^2} \quad \text{for } x < 0.$$

(a) Explain why the function fg does **not** exist. [1]

(b) Given that the function gf does exist, find and simplify an expression for $\mathrm{gf}(x)$. [2]

(c) Show that $\mathrm{f}^{-1}(x)$ can be written as $\frac{px - \sqrt{x(qx+r)}}{3}$ where p, q and r are integers. [4]

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10 **(a)** Show that $(\tan x + \sec x)^2$ can be written as $\frac{1+\sin x}{1-\sin x}$. [4]

(b) Hence solve the equation $(\tan 3\theta + \sec 3\theta)^2 = 6$ for $0° \leqslant \theta \leqslant 180°$. [4]