Question Number	Scheme	Marks
1(a)	$\mathrm{f}(x) \geqslant \ln 3$	B1
		(1)
(b)	$\mathrm{g}^{-1}(x) = \dfrac{3-2x}{x-5}$ or $-2-\dfrac{7}{x-5}$ oe $x<5$	M1A1 B1
		(3)
(c)	$\mathrm{g}(0) = \dfrac{3}{2} \Rightarrow \mathrm{f}\left(\dfrac{3}{2}\right) = \ln\left(\dfrac{21}{4}\right)$	M1A1
		(2)
(d)	$\dfrac{3+5\mathrm{e}^{2a}}{\mathrm{e}^{2a}+2} = 4 \Rightarrow 5\mathrm{e}^{2a}+3 = 4\mathrm{e}^{2a}+8 \Rightarrow \mathrm{e}^{2a} = \ldots$ $\mathrm{e}^{2a} = 5 \Rightarrow 2a = \ln 5 \Rightarrow a = \ldots$ $a = \dfrac{1}{2}\ln 5$	M1 dM1 A1
		(3)
		(9 marks)

(a)

B1: $\mathrm{f}(x) \geqslant \ln 3$ o.e. Accept with *y* in place of f(*x*).

(b)

M1: Attempts to rearrange to find the inverse. Score for achieving the form $y = \dfrac{\pm 3 \pm 2x}{\pm x \pm 5}$ or $x = \dfrac{\pm 3 \pm 2y}{\pm y \pm 5}$. If they use $y = 5 - \dfrac{7}{\mathrm{x}+2}$ score for reaching $x = \dfrac{\pm 7}{\pm 5 \pm y} \pm 2$ oe for *y* =….

A1: $\mathrm{g}^{-1}(x) = \dfrac{3-2x}{x-5}$ o.e. (e.g. see scheme). Allow with just g^{-1} or *y* or even f^{-1}

B1: $x<5$

(c)

M1: Attempts to find $\mathrm{fg}(0)$. May find the function $\mathrm{fg}(x)$ and substitute 0 into this. Condone slips. May be implied by awrt 1.7 if no substitution is shown.

A1: $\ln\left(\dfrac{21}{4}\right)$ or exact simplified equivalent and isw.

(d)

M1: Sets $\dfrac{3+5\mathrm{e}^{2a}}{\mathrm{e}^{2a}+2} = 4$ and proceeds to make e^{2a} (or condone $A\mathrm{e}^{2a}$) the subject. They must achieve the 4 although this may appear later in working.

Alternatively, sets $\mathrm{g}^{-1}\mathrm{g}(\mathrm{e}^{2a}) = \mathrm{g}^{-1}\mathrm{f}\left(\sqrt{\mathrm{e}^4-3}\right) \Rightarrow \mathrm{e}^{2a} = \mathrm{g}^{-1}(4) = \dfrac{-5}{-1} = 5$