3	**(a)**		$\mathrm{f}(x)=2\left[x^2+3x\right]=2\left[(x+\tfrac{3}{2})^2-\left(\tfrac{3}{2}\right)^2\right]$	**M1**	**3.1a**	Attempt to complete the square – must have $2\left(x+\tfrac{3}{2}\right)^2\pm\ldots$	Or $\mathrm{f}'(x)=4x+6$ and solves equal to zero Or finds *x*-coordinate of vertex
			$\mathrm{f}(x)=2\left(x+\dfrac{3}{2}\right)^2-\dfrac{9}{2}\Rightarrow-\dfrac{9}{2}$	**A1**	**1.1**	Correct completing the square and selection of $-\tfrac{9}{2}$	Or by differentiation
			Range of f(*x*): $\mathrm{f}(x)\geq-\dfrac{9}{2}$	**A1**	**1.2**	cao – or equivalent notation e.g. set notation $\{\mathrm{f}(x):\mathrm{f}(x)\geq-\tfrac{9}{2}\}$ or $\left[-\tfrac{9}{2},\infty\right)$	Allow in terms of f, *y* but not *x*
				[3]			
3	**(b)**		Function is not one-one	**B1**	**2.4**	Or different *x*-values give the same *y*-value (oe) e.g. function is many-one	
				[1]			
3	**(c)**		$\mathrm{g}^{-1}(a)=\tfrac{1}{3}(a-2)$	**B1**	**1.1**	Or in terms of *x*	Or $a=\mathrm{gfg}(-2)$ (or *x* = …)
			$\mathrm{fg}(-2)=\mathrm{f}(-4)\left[=2(-4)^2+6(-4)\right]$	**M1***	**1.2**	Correct order of operations for fg so $\mathrm{f}(-4)$ is sufficient	$a=\mathrm{gf}('-4')$
			$8=\tfrac{1}{3}(a-2)\Rightarrow a=\ldots$	**M1dep***	**1.1**	Sets their $\mathrm{fg}(-2)$ equal to correct $\mathrm{g}^{-1}(a)$ and solves for *a* or *x*	$a=\mathrm{g}('8')$
			$a=26$	**A1**	**2.2a**	Condone *x* = 26	
				[4]			
3	**(d)**		$2x^2+6x>3x+2\Rightarrow2x^2+3x-2>0$	**M1**	**1.1**	Sets f(*x*) > g(*x*) and rearranges correctly and solves equality (giving two c.v.)	Can be implied by both c.v. stated correctly
			Critical values $\tfrac{1}{2},\ -2$	**A1**	**1.1**		
			$\left\{x:x>\tfrac{1}{2}\right\}\cup\left\{x:x<-2\right\}$	**A1**	**2.5**	Correct set notation e.g. $(-\infty,-2)\cup\left(\tfrac{1}{2},\infty\right)$ but not $x>\tfrac{1}{2}$ or $x<-2$	

				[3]			