Question	Scheme	Marks	AOs
8 (i)	E.g. $y^2 - 4y + 7 = (y-2)^2 - 4 + 7$	M1	2.1
	$= (y-2)^2 + 3 \geqslant 3$, as $(y-2)^2 \geqslant 0$ and so $y^2 - 4y + 7$ is positive for all real values of y	A1	2.2a
		(2)	
(ii)	For an explanation or statement to show when (Bobby's) claim $e^{3x} \geqslant e^{2x}$ fails. This could be e.g. • when $x = -1$, $e^{-3} < e^{-2}$ **or** e^{-3} is not greater than or equal to e^{-2} • when $x < 0$, $e^{3x} < e^{2x}$ **or** e^{3x} is not greater than or equal to e^{2x}	M1	2.3
	Followed by an explanation or statement to show when (Bobby's) claim $e^{3x} \geqslant e^{2x}$ is true. This could be e.g. • $\boldsymbol{x = 2}$, $e^6 \geqslant e^4$ **or** e^6 is greater than or equal to e^4 • when $x \geqslant 0$, $e^{3x} \geqslant e^{2x}$ **and** a correct conclusion. E.g. • (Bobby's) claim is sometimes true	A1	2.4
		(2)	
(ii) **Alt 1**	Assuming $e^{3x} \geqslant e^{2x}$, then $\ln(e^{3x}) \geqslant \ln(e^{2x}) \Rightarrow 3x \geqslant 2x \Rightarrow x \geqslant 0$	M1	2.3
	Correct algebra, using logarithms, leading from $e^{3x} \geqslant e^{2x}$ to $x \geqslant 0$ **and** a correct conclusion. E.g. (Bobby's) claim is sometimes true	A1	2.4
(iii)	Assume that n^2 is even and n is odd. So $n = 2k + 1$, where k is an integer.	M1	2.1
	$n^2 = (2k+1)^2 = 4k^2 + 4k + 1$ So n^2 is odd which contradicts n^2 is even. So (Elsa's) claim is true.	A1	2.4
		(2)	
(iv)	For an explanation or statement to show when (Ying's) claim "the sum of two different irrational numbers is irrational" fails This could be e.g. • $\pi, 9 - \pi$; sum $= \pi + 9 - \pi = 9$ is not irrational	M1	2.3
	Followed by an explanation or statement to show when (Ying's) claim "the sum of two different irrational numbers is irrational" is true. This could be e.g. • $\pi, 9 + \pi$; sum $= \pi + 9 + \pi = 2\pi + 9$ is irrational and a correct conclusion. E.g. • (Ying's) claim is sometimes true	A1	2.4
		(2)	
			(8 marks)

Question 8 Notes:	
(i)	
M1:	Attempts to • complete the square **or** • find the minimum by differentiation **or** • draw a graph of $f(y) = y^2 - 4y + 7$
A1:	Completes the proof by showing $y^2 - 4y + 7$ is positive for all real values of *y* with no errors seen in their working.
(ii)	
M1:	See scheme
A1:	See scheme
(ii)	
Alt 1	
M1:	Assumes $e^{3x} \geqslant e^{2x}$, takes logarithms and rearranges to make *x* the subject of their inequality
A1:	See scheme
(iii)	
M1:	Begins the proof by negating Elsa's claim and attempts to define *n* as an odd number
A1:	Shows $n^2 = 4k^2 + 4k + 1$, where *n* is correctly defined and gives a correct conclusion
(iv)	
M1:	See scheme
A1:	See scheme