Question	Scheme	Marks	AOs
10	$x = t^2,\ y = 2t \Rightarrow t^4 + 4t^2 = 10t^2 + k \Rightarrow t^4 - 6t^2 - k = 0$ or $y = 2t \Rightarrow x = \frac{y^2}{4} \Rightarrow \frac{y^4}{16} + y^2 = \frac{10y^2}{4} + k \Rightarrow y^4 - 24y^2 - 16k = 0$ or $x = t^2 \Rightarrow y = 2\sqrt{x} \Rightarrow x^2 + 4x = 10x + k \Rightarrow x^2 - 6x - k = 0$	M1 A1	3.1a 1.1b
	Roots must be real: $b^2 - 4ac > 0 \Rightarrow 6^2 + 4k > 0 \Rightarrow k > -9$ or e.g. $b^2 - 4ac > 0 \Rightarrow 24^2 + 64k > 0 \Rightarrow k > -9$	dM1 A1	3.1a 1.1b
	Both roots must be positive so e.g.: $6 - \sqrt{36+4k} > 0 \Rightarrow k < 0$	B1	2.2a
	$\{k : k < 0\} \cap \{k : k > -9\}$	A1	2.5
		(6)	

(6 marks)

Notes

M1: Makes the key step of using the Cartesian equation with the parametric equations to eliminate 2 of the variables

A1: Correct 3TQ in t^2, y^2 or x

dM1: Recognises the condition that $b^2 - 4ac > 0$ as roots must be real and uses this to find the minimum value for k

A1: For $k > -9$ seen as part of their solution

B1: Deduces that as both roots must be positive, $k < 0$

A1: Correct range using the correct notation. Allow equivalents e.g. $\{k : -9 < k < 0\}$, $k \in (-9, 0)$