and allow e.g. $4x^2-41x+100=0 \Rightarrow (4x-25)(4x-16)=(4x-25)(x-4)=0 \Rightarrow x=\frac{25}{4}$, 4

A1: $x=\frac{25}{4}$ only. If $x = 4$ is also seen, it must clearly be rejected or the $x=\frac{25}{4}$ clearly selected.
Ignore any attempts to find y.

(c)	$y \le 2x^2-16x+50, \quad y \ge "\frac{9}{2}x"$	B1ft
	Fully defined region E.g. $\frac{9}{2}x \le y \le 2x^2-16x+50$ and $0 \le x \le 4$	B1ft
		(2)
		(10 marks)

Notes

Some candidates are answering (c) at the bottom of the first page of the question so please check there.

Allow use of f(x) for y.

Do not allow use of R for y e.g. $R \le 2x^2-16x+50$ or e.g. $y >$ line

B1ft: Uses C and l with inequalities in the correct directions and ignore any other inequalities for this mark.
Allow strict or non-strict inequalities and condone a mix of both for this mark.
Follow through on their equation for l and their possibly incorrect completed square form for C.

Examples:

$y < 2x^2-16x+50$ and $y \ge "\frac{9}{2}x"$ or e.g. $"\frac{9}{2}x" < y < 2x^2-16x+50$

B1ft: Correct and fully **consistently** defined region and no incorrect inequalities.
Follow through on their equation for l and their possibly incorrect completed square form for C.
For the restriction on x, allow e.g. $0 < x < 4$ or written separately as e.g. $x > 0$, $x < 4$ and allow $0 < x < a$ where $a < \frac{25}{4}$

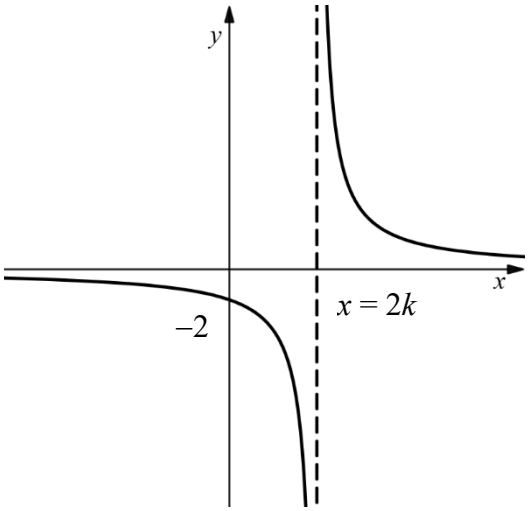
If extra inequalities are given that do not contradict then they can be ignored (see example below)

Examples of full marks in (c):

$y \le 2x^2-16x+50, \quad y \ge "\frac{9}{2}x", \quad x \ge 0, \quad x \le 4$

$"\frac{9}{2}x" < y < 2x^2-16x+50, \quad 0 < x < 4$

$"\frac{9}{2}x" < y, \; y < 2x^2-16x+50, \quad 0 < x, \; x < 6.25, \; y > 0$

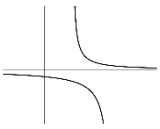
Question Number	Scheme		Marks
6(a)		Shape in quadrant 1	M1
		Fully correct shape and position	A1
		Cuts the y-axis at -2	B1
		Vertical asymptote at $x = 2k$	B1
			(4)

(a) Notes

Marks cannot be scored without a sketch.

M1: Correct shape in quadrant one for the right hand branch. It must not cross either axis but be tolerant of functions that don't go down as far as the x-axis and do extend as far left as the y-axis.
Condone curves that touch the x or y-axis as long as they do not cross the axis.
Ignore any asymptotes, correct or incorrect, for this mark.

A1: Correct shape and position (for whole curve). Be tolerant of slips of the pen but the intention should be clear. Look for the curve in quadrants 1, 3 and 4 with a vertical asymptote in quadrant 1 and 4. The left hand branch must extend into quadrant 3 and should not intentionally dip away from the x-axis to e.g. create an intentional maximum.
There should be no horizontal asymptotes other than the x-axis.

Do not allow this mark if the branches clearly overlap vertically. E.g. 

B1: Cuts or touches the negative y-axis **once** at -2
Must be in the correct position but allow as -2 or $y = -2$ and condone $(-2, 0)$ as long as it is in the correct place. Condone missing brackets e.g. $0, -2$
Allow to appear away from the sketch but it must be fully correct e.g. $(0, -2)$
If there is any ambiguity, the sketch takes precedence.

B1: For **one** vertical asymptote to the right of the y-axis marked $x = 2k$
It must be labelled as an equation and not just a value on the y-axis and it must correspond with the sketch.
The asymptote does not need to be drawn as a dotted line but the curve must be asymptotic to the correct line for either branch.
Allow $x = 2k$ to appear away from the sketch but it must be correct and correspond with the sketch. If there is any ambiguity, the sketch takes precedence.

6(b)	$\frac{4k}{x-2k}=6-2x \Rightarrow 4k=6x-12k-2x^2+4kx$ o.e.	M1 A1
	$2x^2-(4k+6)x+16k=0 \Rightarrow b^2-4ac=(4k+6)^2-4\times 2\times 16k$	**d**M1
	$4k^2-20k+9=0 \Rightarrow (2k-1)(2k-9)=0 \Rightarrow k=\frac{1}{2},\frac{9}{2}$ so $0<k\leq\frac{1}{2}, k\geq\frac{9}{2}$	**dd**M1 A1
		(5)
		(9 marks)

(b) Notes

M1: Equates curve with given line and attempts to form a quadratic equation.
The terms do not need to be collected.
Look for $\frac{4k}{x-2k}=6-2x$ cross multiplies (condoning slips) and proceeds to a quadratic equation.

A1: Correct quadratic equation with brackets expanded which may be unsimplified e.g.
$\frac{4k}{x-2k}=6-2x \Rightarrow 4k=6x-12k-2x^2+4kx$

dM1: Correct attempt to find the discriminant b^2-4ac for their $ax^2+bx+c=0$ with both *b* and *c* expressions in terms of *k*. May be seen embedded in an attempt at the quadratic formula.
It is dependent upon the previous Method mark.

ddM1: Solves their 3 term quadratic equation/inequality in *k* resulting from $b^2-4ac...0$ **and** chooses the **outside region** for their critical values.
Allow calculator solutions for solving their 3TQ and condone factors that are inconsistent with their equation so just look for the correct or correct ft roots with an attempt at the outside regions e.g. condone $4k^2-20k+9=0 \Rightarrow \left(k-\frac{1}{2}\right)\left(k-\frac{9}{2}\right)=0 \Rightarrow k=\frac{1}{2},\frac{9}{2} \Rightarrow k<\frac{1}{2}, k>\frac{9}{2}$

The roots may be embedded so allow e.g. $4k^2-20k+9=0 \Rightarrow k\leq\frac{1}{2}, k\geq\frac{9}{2}$ to imply this mark.

Condone the boundaries not being included in the inequality and condone the omission of $k>0$
Condone the use of *x* rather than *k*.
It is dependent upon both previous Method marks.

A1: CSO $0<k\leq\frac{1}{2}, k\geq\frac{9}{2}$ o.e. Must be in terms of *k*.