Question Number	Scheme	Marks
5(a) **(i)**	7	B1
(ii)	$\frac{9}{k}$	B1
		(2)
(b)	$kx-9-2=0$ and $-kx+9-2=0 \Rightarrow \frac{\ldots}{k}, \frac{\ldots}{k}$	M1
	CVs $\frac{7}{k}, \frac{11}{k}$	A1
	$\frac{7}{k} < x < \frac{11}{k}$	A1
		(3)
(c)	$"-2" = -2 \times "\frac{9}{k}" + 3 \Rightarrow k = \ldots$	M1
	$(k =)\ 3.6$	A1
	$k > 3.6$	A1
		(3)
		(8 marks)
Alt(b)	$-2 < kx - 9 < 2$	
	$\frac{\ldots}{k} < x < \frac{\ldots}{k}$	M1
	$\frac{7}{k} < x < \frac{11}{k}$	A1A1

(a) Check Figure 2 and by the questions

(i)

B1 7 Condone $(0, 7)$ but not $(7, 0)$

(ii)

B1 $\frac{9}{k}$ oe Condone $\left(\frac{9}{k}, -2\right)$ but not $\left(-2, \frac{9}{k}\right)$

(b)

M1 A correct attempt to find the two critical values. Eg

- Forms two correct equations (or linear inequalities) with the modulus signs removed and solves to find the values of x where the graph crosses the x-axis (see main scheme) or the values of x such that $|kx-9|-2<0$
- Solves the given inequality to isolate x in the middle (Alt(b)) by:
  $|kx-9|-2<0 \Rightarrow |kx-9|<2 \Rightarrow -2<kx-9<2 \Rightarrow ...<x<...$
- Solves the given inequality by squaring both sides and solving:
  $(kx-9)^2<4 \Rightarrow k^2x^2-18kx+77<0 \Rightarrow x^2-\frac{18}{k}x+\frac{77}{k^2}<0 \Rightarrow \left(x-\frac{9}{k}\right)^2<\frac{4}{k^2} \Rightarrow ...<x<...$

Do not be too concerned by their use of $=, \geqslant, \leqslant, >, <$ throughout their working.

A1 Correct critical values $\frac{7}{k}, \frac{11}{k}$ cao which may be seen in their final answer.

A1 $\frac{7}{k}<x<\frac{11}{k}$ or simplified equivalent eg "$x>\frac{7}{k} \cap x<\frac{11}{k}$" or "$\left\{x \in \mathbb{R} : \frac{7}{k}<x<\frac{11}{k}\right\}$" or $x \in \left(\frac{7}{k}, \frac{11}{k}\right)$ Must be in terms of x

There must be some attempt to bring the two inequalities together if separate. The mark cannot be scored for $x>\frac{7}{k}$ $x<\frac{11}{k}$ DO NOT ACCEPT eg "$x>\frac{7}{k}$ or $x<\frac{11}{k}$" $x \in \left[\frac{7}{k}, \frac{11}{k}\right]$

(c)

M1 Uses a correct method to find a value for k. For example:

- Substitutes in $\left("\frac{9}{k}", "-2"\right)$ into $y=3-2x$ and attempts to find a value for k. They may solve
  $"-2"=3-2x \Rightarrow x="2.5" \Rightarrow "\frac{9}{k}"<"2.5" \Rightarrow k>...$
- Finds when $y=3-2x$ intersects with AB ($y=-kx+7$) and then when $y=3-2x$ intersects with B and forms the inequality $\frac{4}{k-2}<"\frac{9}{k}"$ or similar.
- Finds the value of x when $y=3-2x$ intersects with AB, $y=-kx+7$, $\left(=\frac{4}{k-2}\right)$ and then when $y=3-2x$ intersects $y=kx-11$ $\left(=\frac{14}{k+2}\right)$ and sets equal to each other to find the value for k (or solves simultaneously to find $\Rightarrow x="2.5" \Rightarrow "\frac{9}{k}"<"2.5" \Rightarrow k>..$)
- Finds the gradient between $(0,3)$ and B and deduces that $-2>\frac{"-2"-3}{"\frac{9}{k}"-0}$ oe leading $k=\ldots$
- Sets $f(x)=3-2x$ and attempts the discriminant leading to a value for k:
  $3-2x=|kx-9|-2 \Rightarrow (5-2x)^2=(kx-9)^2 \Rightarrow (4-k^2)x^2+(18k-20)x-56=0$

$b^2-4ac=0 \Rightarrow (18k-20)^2-4(4-k^2)\times(-56)=0 \Rightarrow 100k^2-720k+1296=0 \Rightarrow k=...$

(allow two values for *k* from a quadratic)

In each method do not be too concerned by their use of $=, \geqslant, \leqslant, >, <$ throughout their working. Condone arithmetical slips.

A1 $(k=)$ 3.6 oe

Question Number	Scheme	Marks
6(a)	$(\mathrm{f}'(x)=) 5(x^2-2)\times\frac{1}{2}\times 4\times(4x+9)^{-\frac{1}{2}}+10x(4x+9)^{\frac{1}{2}}$ $(\mathrm{f}'(x)=) \frac{10(x^2-2)+10x(4x+9)}{(4x+9)^{\frac{1}{2}}}=\frac{50x^2+90x-20}{(4x+9)^{\frac{1}{2}}}$ $(\mathrm{f}'(x)=) \frac{10(5x^2+9x-2)}{(4x+9)^{\frac{1}{2}}}$	M1A1 dM1 A1
		(4)
(b)	Sets $\mathrm{f}'(x)=0$ to give $x=-2, \frac{1}{5}$	B1
		(1)
(c)	$y=5\left(("-2")^2-2\right)\left(4\times("-2")+9\right)^{\frac{1}{2}}=10$ $(-2, 10)$	M1 A1cao
		(2)
(d)	$\mathrm{f}(0)=-30$ $\text{Upper bound}=2\times"10"+4=...$ or $\text{Lower bound}=2\times"-30"+4=...$ $-56\leqslant \mathrm{g}(x)\leqslant 24$	B1 M1 A1
		(3)
		(10 marks)

A1 $k>3.6$ or eg $k>\frac{18}{5}$ but not $k\geqslant\frac{18}{5}$ If $k<-2$ is found then it must be rejected

(a)

M1 Attempts the product rule. Award for $\pm A(5x^2-10)(4x+9)^{-\frac{1}{2}}\pm Bx(4x+9)^{\frac{1}{2}}$ or equivalent where $A, B \neq 0$ The indices do not need to be processed for this mark.

If they quote the product rule eg $uv'+u'v$ and state the expressions for u, u', v and v' then allow a miscopy when substituted. They must have