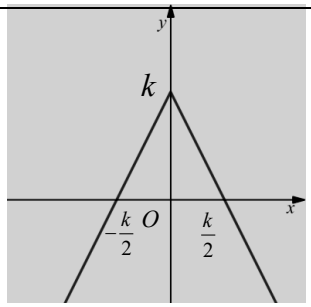
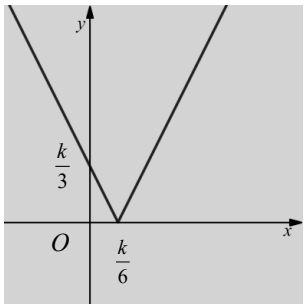
Question Number	Scheme		Marks
6(a)(i)		Shape	M1
		Correct intercepts.	A1
(ii)		Shape	M1
		Correct intercepts.	A1
			(4)
(b)	Attempts to solve either $k+2x=-2x+\frac{k}{3}$ **or** $k-2x=2x-\frac{k}{3}$		M1
	Achieves either $x=-\frac{1}{6}k$ **or** $x=\frac{1}{3}k$ oe		A1
	Attempts to solve both $k+2x=-2x+\frac{k}{3}$ **and** $k-2x=2x-\frac{k}{3}$		M1
	Achieves either $x=-\frac{1}{6}k$ **and** $x=\frac{1}{3}k$		A1
			(4)
			(8 marks)

(a)

M1: For the shape of $y=k-2\left|x\right|$. Score for an upside down V with maximum on the *y*-axis with the branches at least reaching the *x*-axis.

A1: Intercepts at k on the *y*-axis and $\pm\frac{k}{2}$ on the *x*-axis. Allow as values or coordinates and allow coordinates the wrong way round (e.g. (*k*, 0) for (0, *k*)) as long as they are in the correct places. The graph must cross the axes at these points.

M1: For the shape of $y=\left|2x-\frac{k}{3}\right|$. Score for a V shape in quadrants 1 and 2 with a minimum on the *x*-axis and at least reaches the *y*-axis.

A1: Intercepts at $\frac{k}{3}$ on the *y*-axis and $\frac{k}{6}$ on the *x*-axis. Allow as values or coordinates and allow coordinates the wrong way round (e.g. (*k*/3, 0) for (0, *k*/3)) as long as they are in the correct places. The graph must cross the *y*-axis and touch the *x*-axis.

(b)

M1: Attempts to solve one correct equation not involving moduli (or equivalent equations)

A1: One correct solution. Allow unsimplified forms such as $-\frac{2k}{12}$

M1: Attempts to solve two correct equations not involving moduli (or equivalent equations)
A1: Two correct solutions (simplified) and no other solutions given.

Some may square in (b) e.g.

$$\left(2x-\frac{k}{3}\right)^2=(k-2x)^2 \Rightarrow 4x^2-\frac{4kx}{3}+\frac{k^2}{9}=k^2-4kx+4k^2 \Rightarrow \frac{8kx}{3}=\frac{8k^2}{9} \Rightarrow x=\frac{k}{3}$$

Score M1 for squaring to obtain at least 3 terms on both sides and solving for x and A1 for $x=\frac{k}{3}$

Candidates are unlikely to find the other root using this approach.

Question Number	Scheme	Marks
7	$x = 6\sin^2 2y \Rightarrow \dfrac{\mathrm{d}x}{\mathrm{d}y} = 24\sin 2y\cos 2y$	M1 A1
	Attempts to use $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 1 \div \dfrac{\mathrm{d}x}{\mathrm{d}y}$	M1
	Attempts to use both $\sin 2y = \sqrt{\dfrac{x}{6}}$ and $\cos 2y = \sqrt{1-\sin^2 2y} = \sqrt{1-\dfrac{x}{6}}$	M1
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{24\sin 2y\cos 2y} = \dfrac{1}{24\times\sqrt{\dfrac{x}{6}}\times\sqrt{1-\dfrac{x}{6}}} = \dfrac{1}{4\sqrt{6x-x^2}}$	A1
		(5)
Way 2	$x = 6\sin^2 2y = 3-3\cos 4y \Rightarrow \dfrac{\mathrm{d}x}{\mathrm{d}y} = 12\sin 4y$	M1A1
	Attempts to use $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 1 \div \dfrac{\mathrm{d}x}{\mathrm{d}y}$	M1
	Attempts to use $\sin 4y = \dfrac{\sqrt{6x-x^2}}{3}$	M1
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{12\sin 4y} = \dfrac{1}{12\times\dfrac{\sqrt{6x-x^2}}{3}} = \dfrac{1}{4\sqrt{6x-x^2}}$	A1
Way 3	$x = 6\sin^2 2y = 24\sin^2 y\cos^2 y \Rightarrow \dfrac{\mathrm{d}x}{\mathrm{d}y} = 48\sin y\cos^3 y - 48\sin^3 y\cos y$	M1A1
	Attempts to use $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 1 \div \dfrac{\mathrm{d}x}{\mathrm{d}y}$	M1
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{48\sin y\cos^3 y - 48\sin^3 y\cos y} = \dfrac{1}{48\sin y\cos y\left(\cos^2 y-\sin^2 y\right)}$ $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{24\sin 2y\cos 2y} = \dfrac{1}{24\times\sqrt{\dfrac{x}{6}}\times\sqrt{1-\dfrac{x}{6}}}$	M1
	$= \dfrac{1}{4\sqrt{6x-x^2}}$	A1
		(5 marks)