Question Number	Scheme	Marks
2	$\left\|x^2-9\right\|<\left\|1-2x\right\|$ **(ignore use of any strict/non-strict inequalities instead of "=" when finding cv's)**	
	$x^2-9=1-2x\Rightarrow x^2+2x-10=0\Rightarrow x=...$ **or** $x^2-9=-1+2x\Rightarrow x^2-2x-8=0\Rightarrow x=...$	M1
	$x=\dfrac{-2\pm\sqrt{44}}{2}$ **or** $x=-2,\ 4$	A1
	$x^2-9=1-2x\Rightarrow x^2+2x-10=0\Rightarrow x=...$ **and** $x^2-9=-1+2x\Rightarrow x^2-2x-8=0\Rightarrow x=...$	**d**M1
	$x=\dfrac{-2\pm\sqrt{44}}{2}$ **and** $x=-2,\ 4$	A1
	One of: $-1+\sqrt{11}<x<4$ **or** $-1-\sqrt{11}<x<-2$	A1
	Both $-1+\sqrt{11}<x<4$ **and** $-1-\sqrt{11}<x<-2$	A1
		(6)

Notes

M1: Attempts to solve $x^2-9=1-2x$ oe **or** $x^2-9=-1+2x$ oe to obtain 2 non-zero values of x.
Must be solving a 3TQ – see general guidance but also allow calculator solutions so this mark may be implied by correct values for their 3TQ (you may need to check).

A1: **One** correct **pair** of values. May be seen embedded in an inequality or e.g. on a sketch.
Allow the irrational roots to be at least as given here or $-1\pm\sqrt{11}$ or awrt 2.3, –4.3 or truncated 2.3...,–4.3…

dM1: Attempts to solve $x^2-9=1-2x$ oe **and** $x^2-9=-1+2x$ oe to obtain 4 non-zero values of x.
Must be solving a 3TQ – see general guidance but also allow calculator solutions so this mark may be implied by correct values for their 3TQ (you may need to check).
Depends on the first method mark.

A1: **Both pairs** of values correct. May be seen embedded in an inequality or e.g. on a sketch.
Allow the irrational roots to be at least as given here or $-1\pm\sqrt{11}$ or awrt 2.3, –4.3 or truncated 2.3..., –4.3…

For the final 2 marks (which must follow both previous method marks):

For $-1+\sqrt{11}$ allow $\dfrac{-2+\sqrt{44}}{2}$, for $-1-\sqrt{11}$ allow $\dfrac{-2-\sqrt{44}}{2}$ but must be exact here.

Allow alternative notation e.g. $\left(-1+\sqrt{11},\ 4\right)$, $\left(-1-\sqrt{11},\ -2\right)$, $4>x>-1+\sqrt{11},\ \ x>-1+\sqrt{11}$ **and** $x<4$, $-2>x>-1-\sqrt{11},\ \ x>-1-\sqrt{11}$ **and** $x<-2$

A1: One correct inequality.

A1: Both inequalities correct. Allow the inequalities to be written separately or with "," or "or" or "and" or $\cup$ between them but not $\cap$ between them.

In an otherwise fully correct solution, if any extra incorrect regions are given, deduct the final A mark.

	Q2 Alternative by squaring (ignore use of any strict/non-strict inequalities instead of "=" when finding cv's)	
	$\left(x^2-9\right)^2=\left(1-2x\right)^2 \Rightarrow x^4-18x^2+81=1-4x+4x^2$	
	$x^4-22x^2+4x+80=0 \Rightarrow x=...$	M1
	$x=\dfrac{-2\pm\sqrt{44}}{2}$ **or** $x=-2,\ 4$	A1
	$x=\dfrac{-2\pm\sqrt{44}}{2}$ **and** $x=-2,\ 4$	**d**M1A1
	$-1+\sqrt{11}<x<4$ **or** $-1-\sqrt{11}<x<-2$	A1
	$-1+\sqrt{11}<x<4$ **and** $-1-\sqrt{11}<x<-2$	A1

Notes

M1: Attempts to square both sides, collect terms, rearrange and solve a quartic equation to obtain at least 2 values of x that are non-zero. Allow calculator solutions so this mark may be implied by correct values for their quartic (you may need to check).

A1: **One** correct pair of values. It is for $-2,\ 4$ or $-1\pm\sqrt{11}$. May be seen embedded in an inequality or e.g. on a sketch.

Allow the irrational roots to be at least as given here or $-1\pm\sqrt{11}$ or awrt 2.3, –4.3 or truncated 2.3...,–4.3…

dM1: Obtains 4 non-zero values of x. Allow calculator solutions so this mark may be implied by correct values for their quartic (you may need to check).

Depends on the first method mark.

A1: **Both** pairs of values correct. May be seen embedded in an inequality or e.g. on a sketch.

Allow the irrational roots to be at least as given here or $-1\pm\sqrt{11}$ or awrt 2.3, –4.3 or truncated 2.3..., –4.3…

For the final 2 marks (which must follow both previous method marks):

For $-1+\sqrt{11}$ allow $\dfrac{-2+\sqrt{44}}{2}$, for $-1-\sqrt{11}$ allow $\dfrac{-2-\sqrt{44}}{2}$ but must be exact here.

Allow alternative notation e.g. $\left(-1+\sqrt{11},\ 4\right)$, $\left(-1-\sqrt{11},\ -2\right)$, $4>x>-1+\sqrt{11}$, $x>-1+\sqrt{11}$ **and** $x<4$, $-2>x>-1-\sqrt{11}$, $x>-1-\sqrt{11}$ **and** $x<-2$

A1: One correct inequality.

A1: Both inequalities correct. Allow the inequalities to be written separately or with "," or "or" or "and" or $\cup$ between them but not $\cap$ between them.

In an otherwise fully correct solution, if any extra incorrect regions are given, deduct the final A mark.

3.

$$(\cos x)\frac{dy}{dx} + (\sin x)y = 2\cos^3 x \sin x - 3 \qquad 0 \leqslant x < \frac{\pi}{2}$$

(a) Find the general solution of this differential equation.
Give your answer in the form $y = f(x)$.

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(b) Find the particular solution of this differential equation for which $y = 3\sqrt{3}$ at $x = \frac{\pi}{3}$

Give your answer in the form $y = f(x)$.

(3)

(Total for Question 3 is 10 marks)