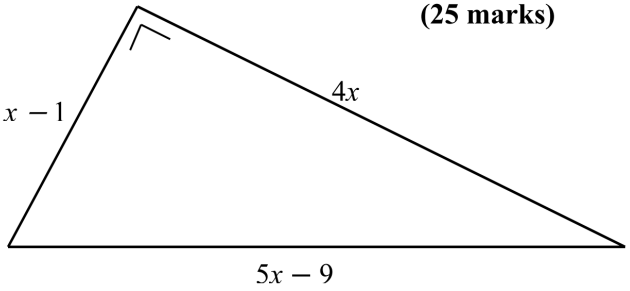
Question 5 **(25 marks)**

(a) **(i)** The lengths of the sides of a right-angled triangle are given by the expressions $x - 1$, $4x$, and $5x - 9$, as shown in the diagram. Find the value of x.



(ii) Verify, with this value of x, that the lengths of the sides of the triangle above form a pythagorean triple.

(b) **(i)** Show that $f(x) = 3x - 2$, where $x \in \mathbb{R}$, is an injective function.

(ii) Given that $f(x) = 3x - 2$, where $x \in \mathbb{R}$, find a formula for f^{-1}, the inverse function of f. Show your work.

Q5	Model Solution – 25 Marks	Marking Notes
(a) (i)	$(5x-9)^2=(x-1)^2+(4x)^2$ $8x^2-88x+80=0$ $x^2-11x+10=0$ $(x-1)(x-10)=0$ $x=1 \text{ or } x=10$ $x=10$	Scale 10D (0, 2, 5, 8, 10) *Low Partial Credit* • any use of Pythagoras *Mid Partial Credit* • fully correct substitution *High Partial Credit* • both roots correct
(a) (ii)	Sides=9, 40, 41 $9^2+40^2=41^2$ $81+1600=1681$ $1681=1681$	Scale 5B (0, 2, 5) *Partial Credit* • 9 or 40 or 41 • using 1 or -10 from candidates work
(b) (i)	Function is bijective if inverse exists $f^{-1}(x)=\frac{x+2}{3}$ $\Rightarrow$ Function is injective. **or** Horizontal line test. **or** $f(a)=f(b)$ $3a-2=3b-2$ $\Longrightarrow a=b$ **or** $\forall\, a,b\,\varepsilon\, A, f(a)=f(b)\Rightarrow a=b$	Scale 5B (0, 2, 5) *Partial Credit* • $f^{-1}(x)$ written • $f(x)$ drawn • $f(a)=f(b)$
(b) (ii)	$f(x)=3x-2$ $f^{-1}(x)=\frac{x+2}{3}$	Scale 5B (0, 2, 5) *Partial Credit* • any relevant transpose