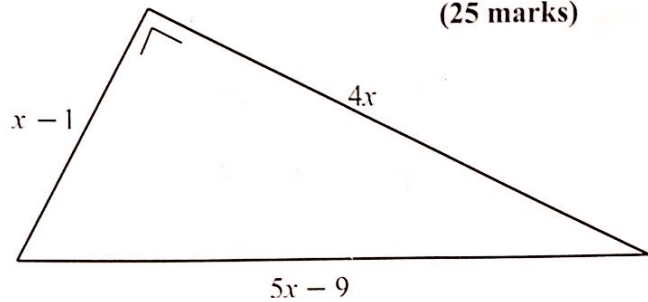


Question 5

(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 .



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$$(5x - 9)^2 = (x - 1)^2 + (4x)^2$$

$$25x^2 - 90x + 81 = x^2 - 2x + 1 + 16x^2$$

$$8x^2 - 88x + 80 = 0$$

$$x^2 - 11x + 10 = 0$$

$$(x - 10)(x - 1) = 0$$

$x = 10$ or ~~$x = 1$~~

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

$$41^2 = 1681$$

$$9^2 + 40^2 = 1681$$

\therefore Pythagorean triple.

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

Find inverse

$$y = 3x - 2$$

$$\frac{y+2}{3} = x$$

$$\therefore f^{-1}(x) = \frac{x+2}{3}$$

\therefore Inverse exists

\therefore Bijective function

\therefore Injective.

- (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.

$$y = 3x - 2$$

$$\frac{y+2}{3} = x$$

$$\therefore f^{-1}(x) = \frac{x+2}{3}$$