

Answer all six questions from this section.

Question 1

(25 marks)

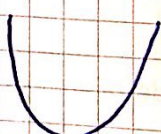
- (a) Write the function $f(x) = 2x^2 - 7x - 10$, where $x \in \mathbb{R}$, in the form $a(x + h)^2 + k$, where a, h , and $k \in \mathbb{Q}$.

$$\begin{aligned} f(x) &= 2 \left(x^2 - \frac{7}{2}x - 5 \right) \\ &= 2 \left[\left(x - \frac{7}{4} \right)^2 - \frac{49}{16} - 5 \right] \\ &= 2 \left[\left(x - \frac{7}{4} \right)^2 - \frac{129}{16} \right] \\ &= 2 \left(x - \frac{7}{4} \right)^2 - \frac{129}{8} \end{aligned}$$

- (b) Hence, write the minimum point of f .

$$\left(\frac{7}{4}, -\frac{129}{8} \right)$$

- (c) (i) Explain why f must have two real roots.

Local minimum is below x -axis
and graph looks like 

- (ii) Write the roots of $f(x) = 0$ in the form $p \pm \sqrt{q}$, where p and $q \in \mathbb{Q}$.

$$f(x) = 2 \left[\left(x - \frac{7}{4} \right)^2 - \frac{129}{16} \right] = 0$$

$$\therefore x = \frac{7}{4} \pm \sqrt{\frac{129}{16}}$$

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