6. $f(x) = x^2 + qx + r \qquad q, r \in \mathbb{Z}$

The equation $f(x) = 0$ has roots α and β

(a) Write down, in terms of q or r

(i) $\alpha + \beta$

(ii) $\alpha\beta$

(1)

Given that $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{1}{2}$ and $\alpha^2 + \beta^2 = 5$

(b) without finding α or β, show that

$$r^2 + br + c = 0$$

where b and c are integers to be determined.

(3)

(c) Hence determine the two possible functions $f(x)$

(3)

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Question 6 continued

(Total for Question 6 is 7 marks)