Question	Scheme	Marks
5.(a)	$2x^2 - 3x + 7 = 0$	
	$\alpha + \beta = \frac{3}{2}, \quad \alpha\beta = \frac{7}{2}$	B1
		(1)
(b)	$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$	M1
	$= \left(\frac{3}{2}\right)^2 - 2\left(\frac{7}{2}\right) = -\frac{19}{4}$	A1
		(2)
(c)	$\text{Sum} = \alpha - \frac{1}{\beta^2} + \beta - \frac{1}{\alpha^2} = \alpha + \beta - \frac{\alpha^2 + \beta^2}{\alpha^2\beta^2} = \frac{3}{2} - \frac{-\frac{19}{4}}{\left(\frac{7}{2}\right)^2} = \frac{185}{98}$	M1A1
	$\text{Prod} = \left(\alpha - \frac{1}{\beta^2}\right)\left(\beta - \frac{1}{\alpha^2}\right) = \alpha\beta - \frac{\alpha + \beta}{\alpha\beta} + \frac{1}{\alpha^2\beta^2} = \frac{7}{2} - \frac{3}{7} + \frac{4}{49} = \frac{309}{98}$	M1A1
	$x^2 - \frac{185}{98}x + \frac{309}{98}(= 0)$	M1
	$98x^2 - 185x + 309 = 0$	A1
		(6)
		(Total 9 marks)

Notes

(a)

B1: Both values correct.

(b)

M1: Attempts to use a correct identity to find the sum of square of roots.

A1: Correct value. Note do not allow recovery from $\alpha + \beta = -\frac{3}{2}$ for this mark.

(c)

M1: Attempts sum for the new roots using their values from (a) and (b). They must be substituting into a correct identity for this mark. If substitution not seen allow for any value appearing after a suitable combined identity is seen.

A1: Correct value.

M1: Attempts product for the new roots using their values from (a). Must be substituting into an expression of the correct form, but allow if a sign slip occurs when expanding. If substitution not seen allow for any value appearing after a suitable expanded identity is seen.

A1: Correct value.

M1: Applies x^2 – (their sum)x + their prod (= 0). May be implied by suitable values for p, q and r stated if no quadratic seen.

A1: Allow any integer multiple. Must include the "= 0", and must be an equation, not just values for p, q and r.

Note: Answers from solving the quadratic will gain no credit for (a) and (b) and only score in (c) if the method marks as described are earned.