

SEF001 Mathematics I
New quadratics from the old
related to the material from M1 - Chapter 2

1. Suppose the roots of $2x^2 - 8x - 1$ are α and β . Suppose another quadratic, $x^2 + qx + r$, has roots:

- (a) $\alpha + \frac{1}{\beta}$ and $\beta + \frac{1}{\alpha}$. What are q and r ?
- (b) $1/(\alpha^3\beta)$ and $1/(\beta^3\alpha)$. What are q and r ?
- (c) $1/(\alpha^2)$ and $1/(\beta^2)$. What are q and r ?
- (d) $1/(\alpha^3)$ and $1/(\beta^3)$. What are q and r ?
- (e) α^2 and β^2 . What are q and r ?
- (f) $\alpha + \beta$ and $\alpha + \beta$. What are q and r ?

2. Suppose the roots of $-2x^2 + x + 4$ are α and β . Suppose another quadratic, $px^2 + qx + r$, has roots:

- (a) $\alpha + \frac{1}{\beta}$ and $\beta + \frac{1}{\alpha}$. What is the form of the new quadratic?
- (b) $1/(\alpha^3\beta)$ and $1/(\beta^3\alpha)$. What is the form of the new quadratic?
- (c) $1/(\alpha^2)$ and $1/(\beta^2)$. What is the form of the new quadratic?
- (d) $1/(\alpha^3)$ and $1/(\beta^3)$. What is the form of the new quadratic?
- (e) α^2 and β^2 . What is the form of the new quadratic?
- (f) $\alpha + \beta$ and $\alpha + \beta$. What is the form of the new quadratic?

[Hint: For each of these you need to find suitable expressions in terms of $\alpha\beta$ and $\alpha + \beta$.]

For each of these, once solved, you can check the correctness of the solution by calculating the roots for the new obtained quadratic and checking the sum and product for the roots.

You can do this by using wolframalpha. Just plug in the numbers for the new quadratics you obtained. And it will give you the roots of the new quadratic. Then calculate the sum and product of the roots.