# Polynomials – Q3 (26/6/23)

If the roots of the equation $x^2 + x - 13 = 0$ are $\alpha \,\&\, \beta$, find the equation with roots $2\alpha + 3\beta$ & $3\alpha + 2\beta$

## Solution

Let the new equation be $x^2 + bx + c = 0$

Then $-b = (2\alpha + 3\beta + 3\alpha + 2\beta) = 5(\alpha + \beta) = 5(-1)$

And $c = (2\alpha + 3\beta)(3\alpha + 2\beta) = 6(\alpha^2 + \beta^2) + 13\alpha\beta$

$= 6\{(\alpha + \beta)^2 - 2\alpha\beta\} + 13\alpha\beta = 6(\alpha + \beta)^2 + \alpha\beta$

$= 6(-1)^2 - 13 = -7$

Hence the new equation is $x^2 + 5x - 7 = 0$