Contents

1 Quadratics

In this section, we review the main ideas in the theory of quadratics in one variable. A *quadratic in* X is an expression of the form $aX^2 + bX + c$, where a, b, and c are constants (or at least independent of X) and $a \neq 0$. A *root* of the quadratic expression $aX^2 + bX + c$ is a value r for which $ar^2 + br + c = 0$.

1.1 Finding roots by factoring

One way that quadratic expressions arise is as a product of two linear expressions,

$$(X-2)(X+3) = X(X+3) - 2(X+3) = X^2 + 3X - 2X - 6 = X^2 + X - 6.$$

For a given quadratic, if we can find linear factors, identifying roots becomes straightforward.

Example 1.1. Find the roots of $X^2 + X - 6$.

Solution. Since this quadratic is equivalent to $(X-2)(X+3)$, the values of X which make the expression evaluate to 0 are those values r for which either $r - 2 = 0$ or $r + 3 = 0$. Hence the roots of $X^2 + X - 6$ are 2 and -3. □