Factoring a Quadratic Polynomial

A quadratic polynomial has the form $ax^2 + bx + c$, a, b, and c are numbers, with $a \neq 0$.

To factor a quadratic polynomial means to rewrite the polynomial as the multiplication of 2 linear polynomials. If a quadratic polynomial cannot be factored then it is called a prime polynomial

$$ax^2 + bx + c = (dx + e)(fx + g)$$

d and f are factors of “a”
e and g are factors of “c”
(d)(g) + (e)(f) = “b”

If a =1 and c is negative and b is negative then c has one positive and one negative factor and the larger of the 2 factors is negative.

Example: $x^2 - 3x - 10 = (x - 5)(x + 2)$

If a =1 and c is positive and b is positive then c has two positive factors.

Example: $x^2 + 9x + 18 = (x + 3)(x + 6)$

If a =1 and c is positive and b is negative then c has two negative factors.

Example: $x^2 - 16x + 63 = (x - 7)(x - 9)$

If the coefficient of x^2 is negative then first factor out -1 from each term of the quadratic.

Example: $-2x^2 + 7x - 3 = -1(2x^2 - 7x + 3) = -1(2x - 1)(x - 3)$

If there is a common term in the polynomial, factor it out before factoring the quadratic.

Example: $2x^4 - 4x^3 - 3x^2 = 2x^2(x^2 - 2x - 3) = 2x^2 (x + 1)(x - 3)$

A polynomial that is the difference between two perfect squares has the form $a^2x^2 - b^2$ and factors to $(ax - b)(ax + b)$

Example: $16x^2 - 25 = (4x - 5)(4x + 5)$