

Algebra and functions

**Quadratic formula**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Completing the square

$$ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + c - \frac{b^2}{4a}$$

Indices

$$a^m a^n = a^{m+n}, \quad (a^m)^n = a^{mn}, \quad a^{-n} = \frac{1}{a^n}, \quad a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Surds

$$\sqrt{ab} = \sqrt{a}\sqrt{b}, \quad \frac{1}{\sqrt{a} + \sqrt{b}} = \frac{\sqrt{a} - \sqrt{b}}{a - b}$$

Factor theorem

$$f(a) = 0 \iff (x - a) \text{ is a factor}$$

Partial fractions

$$\frac{px+q}{(x-a)(x-b)} = \frac{A}{x-a} + \frac{B}{x-b},$$

$$\frac{\dots}{(x-a)^2(x-b)} = \frac{A}{x-a} + \frac{B}{(x-a)^2} + \frac{C}{x-b}$$

Modulus; composite; inverse

$$||x| \quad fg(x) = f(g(x)); \quad ff^{-1}(x) = x$$