"The only way to learn mathematics is to do mathematics." – Paul Halmos

Matteman

HIGH SCHOOL MATHEMATICS

INDICES & SURDS

Laws of Indices:

- $x^0 = 1 \ (where\ x \neq 0)$
- $x^1 = x$
- $x^a \times x^b = x^{a+b}$
- $x^a \div x^b = x^{a-b}$
- $(xy)^n = x^n \times y^n$
- $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
- $(x^m)^n = x^{m \times n}$

Reciprocals:

- $x^{-m} = \frac{1}{x^m}$
- $ax^{-m} = \frac{a}{x^m}$

Difference of two squares:

$$x^2 - y^2 = (x - y)(x + y)$$

Binomials:

$$(x + y)^2 = (x + y)(x + y) = x^2 + 2xy + y^2$$

$$(x - y)^2 = (x - y)(x - y) = x^2 - 2xy + y^2$$

Surds as fractional powers:

- $\sqrt{x} = x^{1/2}$
- $\sqrt[3]{x} = x^{1/3}$
- $\sqrt[n]{x^m} = x^{m/n}$

Manipulating surds:

- $\sqrt{(a\,b)} = \sqrt{a} \times \sqrt{b}$
- $\sqrt{\left(\frac{a}{b}\right)} = \frac{\sqrt{a}}{\sqrt{b}}$
- $\sqrt{a} \times \sqrt{a} = a$

Rationalising denominators:

- *Fractions in the form of* $\frac{1}{\sqrt{a}}$, *multiply the top and bottom by* $\sqrt{a}$.
- *Fractions in the form of* $\frac{1}{a+\sqrt{b}}$, *multiply the top and bottom by* $a - \sqrt{b}$.
- *Fractions in the form of* $\frac{1}{a-\sqrt{b}}$, *multiply the top and bottom by* $a + \sqrt{b}$.