

## Algebra

### Basic Laws

$$(i) a + (b + c) = (a + b) + c$$

$$(ii) a(bc) = (ab)c$$

$$(iii) a + b = b + a$$

$$(iv) ab = ba$$

$$(v) a(b + c) = ab + ac$$

$$(vi) \frac{a + b}{c} = \frac{a}{c} + \frac{b}{c}$$

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### Roots of a quadratic equation

Quadratic Formula

$$ax^2 + bx + c = 0$$

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

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### Linear equations

$$(u + v)^2 = u^2 + 2uv + v^2$$

$$(u - v)^2 = u^2 - 2uv + v^2$$

$$(u + v)(u - v) = u^2 - v^2$$

$$(u + v)(u^2 - uv + v^2) = u^3 + v^3$$

$$(u - v)(u^2 + uv + v^2) = u^3 - v^3$$

$$(u + v)^3 = u^3 + 3u^2v + 3uv^2 + v^3$$

$$(u - v)^3 = u^3 - 3u^2v + 3uv^2 - v^3$$

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### Areas

$$\text{Area of Triangle, } A = \frac{1}{2}ah$$

$$\text{Area of Parallelogram, } A = ah$$

$$\text{Area of Trapezoid, } A = \frac{h}{2}(a + b)$$

$$\text{Area of Circle, } A = \pi r^2$$

$$\text{Area of Ellipse, } A = \pi ab$$

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### Volumes

$$\text{Volume of Cone, } V = \frac{Ah}{3}$$

$$\text{Volume of Right Circular Cylinder, } V = \pi r^2 h$$

$$\text{Volume of Sphere, } V = \frac{4}{3} \pi r^3$$

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### Logarithms

$$y = \log_b x \text{ if } x = b^y$$

$$\log_b(1) = 0$$

$$\log_b(b) = 1$$

$$\log_b(nb) = n$$

$$\log_b(xy) = \log_b x + \log_b y$$

$$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$$

$$\log_b(x^n) = n \log_b x$$

$$\log_b x = \log_b c \log_c x$$

$$\log_b x = \frac{\log_c x}{\log_c b}$$

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### Algebra Formulae

$$x^a x^b = x^{(a+b)}$$

$$x^a y^a = (xy)^a$$

$$(x^a)^b = x^{ab}$$

$$x^{\frac{a}{b}} = \sqrt[b]{x^a}$$

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

$$x^{a-b} = \frac{x^a}{x^b}$$

$$\sqrt{x} \sqrt{y} = \sqrt{xy}$$

$$\sqrt{\sqrt{x}} = \sqrt[4]{x}$$

$$(\sqrt{x})^a = x^{\frac{a}{2}}$$

$$x^0 = 1, (x \neq 0)$$

$$|x^2| = |x|^2 = x^2$$

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### Inequalities

$a > b$  means  $a$  is greater than  $b$

$a < b$  means  $a$  is less than  $b$

$a \geq b$  means  $a$  is greater than or equal to  $b$

$a \leq b$  means  $a$  is less than or equal to  $b$

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