C1 Essentials: *Summary of AQA Core 1 content not provided in the formula book*

Inequalities:

$$x < y \implies -x > -y$$

Quadratic inequalities:

Find critical values by solving $= 0$.

Sketch the curve to identify the required region.

Rationalising the denominator:

$$\frac{1}{a+\sqrt{b}} = \frac{a-\sqrt{b}}{(a+\sqrt{b})(a-\sqrt{b})} = \frac{a-\sqrt{b}}{a^2-b}$$

Straight lines:

$y - y_1 = m(x - x_1)$ Gradient$= \frac{y\text{−}step}{x\text{−}step}$

Perpendicular lines have $m_1 m_2 = -1$

Quadratic formula:

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

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

Completing the square:

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

Roots of quadratics:

No roots: $b^2 - 4ac < 0$

One root: $b^2 - 4ac = 0$

Two roots: $b^2 - 4ac > 0$

Circle equation:

Centre (a, b), radius r:

$$(x-a)^2 + (y-b)^2 = r^2$$

Factor theorem:

$(x - a)$ is a factor $\iff$ a is a root

Remainder theorem:

$P(x) \div (x - a)$ has remainder R $\iff$ $P(a) = R$

Differentiation:

$$y = x^n \implies \frac{dy}{dx} = nx^{n-1}$$

$\frac{dy}{dx}$ is the rate of change of y with respect to x.

$\frac{dy}{dx}$ gives the gradient of the curve y.

$\frac{dy}{dx} > 0 \implies$ Function is increasing.

$\frac{dy}{dx} < 0 \implies$ Function is decreasing.

Stationary points (eg max/min) occur when $\frac{dy}{dx} = 0$.

$\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} > 0 \implies$ min

$\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} < 0 \implies$ max

Integration:

$$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$$

$\int y \, dx$ is the area under the curve y.

$\int_a^b y \, dx$ gives the area bounded by the curve, the x-axis and the lines $x = a$ and $x = b$. If below the axis, integral will be < 0.