## "The Knowledge" - Vital facts to know off by heart

Discriminant and how it determines the number of roots of a quadratic

Quadratic formula

The factor theorem

Sine rule, cosine rule and area of a triangle

Equation of a circle

Graphs of sin, cos and tan (in both degrees and radians)

Special values of sin, cos and tan (in both degrees and radians)

Trigonometric identity for  $\tan \theta$ , the "Pythagorean" identity, and the two that derive from this

Laws of logarithms

Graphs of  $y = x^2$ ,  $y = x^3$ ,  $y = \frac{1}{x}$ ,  $y = \sqrt{x}$ ,  $y = a^x$ ,  $y = \log_a x$ 

How to determine the nature of stationary points from  $\frac{d^2y}{dx^2}$ 

Definitions of concave upwards and concave downwards

Derivatives of  $y = x^n$  and  $y = e^{kx}$ 

Graph transformations y = f(x) + a, y = f(x + a), y = af(x), y = f(ax), y = -f(x), y = f(-x)

The 5 constant acceleration formulae (SUVAT)

Special sums

|wz| and arg(wz) in terms of |w|, |z|, arg(w), arg(z)

Modulus-argument form for a complex number with modulus r and argument  $\theta$ 

Complex loci for the forms  $|z - \alpha| = r$ ,  $\arg(z - \alpha) = \theta$  and  $|z - \alpha| = |z - \beta|$ 

Arc length and area of sector formulae given angle in radians

nth terms and partial sums of arithmetic and geometric sequences (and sum to infinity)

Small angle approximations for  $y = \sin \theta$ ,  $y = \cos \theta$  and  $y = \tan \theta$ 

Standard matrix transformations in 2D

Inverse and determinant of 2x2 matrices, and geometric significance of determinant

Roots of polynomials for quadratics, cubics, quartics (sums, products etc.)

Double angle -  $sin(2\theta)$ ,  $cos(2\theta)$  (in 3 different ways) and  $tan(2\theta)$ 

Standard matrix transformations in 3D

Product and quotient rules

The formula for the angle between two vectors

The general equation of a plane

Chain rule for  $y = (\text{stuff})^n$ ,  $y = e^{\text{stuff}}$ ,  $y = a^{\text{stuff}}$ , y = ln(stuff), y = sin(stuff), y = cos(stuff), y = tan(stuff)

The form of partial fractions for  $\frac{mx+n}{(x+p)(x+q)}$ ,  $\frac{mx+n}{(x+p)(x+q)^2}$  and  $\frac{mx+n}{(x+p)(x^2+q^2)}$ 

The gradient of a curve defined parametrically

The formula for P(A|B)

Two ways of checking for the independence of events A and B

Both definitions of statistical outliers

Distribution of the sample mean of *n* Normally distributed random variables sampled from  $N(\mu, \sigma^2)$