CORE MATHEMATICS 2 (C2) 4722

Algebra

The remainder when a polynomial f(x) is divided by ($x - a$) is f(a)

$a^b = c \rightarrow \log_a c = b$ ie $2^3 = 8 \rightarrow \log_2 8 = 3$

Laws of logarithms:

$$\log_a x + \log_a y \equiv \log_a (xy)$$

$$\log_a x - \log_a y \equiv \log_a \left(\frac{x}{y}\right)$$

$$k \log_a x \equiv \log_a (x^k)$$

Trigonometry

In triangle ABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Tan } \phi = \frac{Sin\phi}{Cos\phi}$$

$$\text{Cos}^2\phi + \text{Sin}^2\phi = 1$$

π radians is 180°

For a sector of a circle: $s = r\phi$

$A = \frac{1}{2} r^2 \phi$

Integration

$$\int x^n \, dx = \frac{1}{n+1} x^{n+1} + c \ (n \neq -1)$$

$$\int \{ f'(x) + g'(x) \} dx = f(x) + g(x) + c$$

Area between a curve and the x-axis is $\int_a^b y\,dx$ for ($y \geq 0$)

Area between a curve and the y-axis is $\int_c^d y\,dx$ for ($x \geq 0$)

Trigonometry

(a) use the sine and cosine rules in the solution of triangles

(b) use the area formula $\Delta = \frac{1}{2} ab\sin C$

(c) understand the definition of a radian, and use the relationship between degrees and radians;

(d) use the formulae $s = r\phi$ and $A = \frac{1}{2} r^2\phi$ for the arc length and sector area of a circle;

(e) relate the periodicity and symmetries of the sine, cosine and tangent functions to the form of their graphs

(f) use the identities $\mathrm{Tan}\ \phi = \dfrac{Sin\phi}{Cos\phi}$

$$\mathrm{Cos}^2\phi + \mathrm{Sin}^2\phi = 1$$

(g) use the exact values of the sine, cosine and tangent of 30° , 45° , 60° e.g cos30° = ½ √ 3 ;

(h) find all the solutions, within a specified interval, of the equations $\sin(kx) = c$, $\cos(kx) = c$, $\tan(kx) = c$, and of equations (for example, a quadratic in sin x) which are easily reducible to these forms.

Sequences and Series

(a) understand the idea of a sequence of terms, and use definitions such as $u_n = n^2$ and relations such as $u_{n+1} = 2u_n$ to calculate successive terms and deduce simple properties

(b) understand and use $\sum$ notation

(c) recognise arithmetic and geometric progressions

(d) use the formulae for the nth term and for the sum of the first n terms to solve problems involving arithmetic or geometric progressions (including the formula ½ $n(n+1)$ for the sum of the first n natural numbers)

(e) use the condition $|r| < 1$ for convergence of a geometric series, and the formula for the sum to infinity of a convergent geometric series

(f) use the expansion of $(a+b)^n$ where n is a positive integer, including the recognition and use of the notations $\left(\frac{n}{r}\right)$ and $n!$ (finding a general term is not included).

Algebra

(a) use the factor theorem and the remainder theorem

(b) carry out simple algebraic division (restricted to cases no more complicated than division of a cubic by a linear polynomial)

(c) sketch the graph of $y = a^x$, where $a > 0$, and understand how different values of a affect the shape of the graph

(d) understand the relationship between logarithms and indices, and use the laws of logarithms (excluding change of base)

(e) use logarithms to solve equations of the form $a^x = b$, and similar inequalities

Integration

(a) understand indefinite integration as the reverse process of differentiation, and integrate x^n (for any rational n except -1), together with constant multiples, sums and differences

(b) solve problems involving the evaluation of a constant of integration, (e.g. to find the equation of the curve through (−1,2) for which $\frac{dy}{dx}$ = 2x + 1

(c) evaluate definite integrals (including e.g. $\int_0^1 x^{\frac{-1}{2}}\,dx$ and $\int_1^\infty x^{-2}\,dx$

(d) use integration to find the area of a region bounded by a curve and lines parallel to the coordinate axes, or between two curves or between a line and a curve

(e) use the trapezium rule to estimate the area under a curve, and use sketch graphs, in simple cases, to determine whether the trapezium rule gives an over-estimate or an under-estimate