INFORMATION BOOKLET

Algebra

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

$$|x| = \begin{cases} x & \text{if} \quad x \geq 0 \\ -x & \text{if} \quad x < 0 \end{cases}$$

$$\sum_{i=1}^{n} 1 = n$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} = \frac{n^2}{2} + \frac{n}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$$

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4} = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$$

$$z = a + bi \qquad z^* = a - bi$$

$$\ell n\, A + \ell n\, B = \ell n\, (AB) \qquad \ell n\, A - \ell n\, B = \ell n \left(\frac{A}{B}\right)$$

$$\ell n\, A^n = n\, \ell n\, A \qquad \log_a x = \frac{\log_b x}{\log_b a}$$

Calculus

$$Area = \lim_{n \to \infty} \left(\frac{b-a}{n}\right) \sum_{i=1}^{n} f(x_i)$$

$$\int_a^b x^n dx = \left[\frac{x^{n+1}}{n+1}\right]_a^b$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$$

$$\int f'(g(x)).g'(x)\, dx = f(g(x)) + C$$

$$\int f(x).g'(x)\, dx = f(x).g(x) - \int g(x).f'(x)\, dx + C$$

$$x_{r+1} = x_r - \frac{f(x_r)}{f'(x_r)}$$

$$V = \pi \int_a^b y^2 dx$$

Function	**Derivative**
x^n	nx^{n-1}
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sec x$	$\sec x.\tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x.\cot x$
$f(g(x))$	$f'(g(x)).g'(x)$
$f(x).g(x)$	$g(x).f'(x)+f(x).g'(x)$
$\dfrac{f(x)}{g(x)}$	$\dfrac{g(x).f'(x)-f(x).g'(x)}{[g(x)]^2}$

$$A=\frac{1}{2}r^2\theta \qquad s=r\theta$$

In $\triangle ABC$:

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

$$a^2=b^2+c^2-2bc.\cos A$$

$$Area=\frac{1}{2}ab.\sin C$$

$$\sin^2 A+\cos^2 A=1 \qquad 1+\tan^2 A=\sec^2 A \qquad 1+\cot^2 A=\operatorname{cosec}^2 A$$

$$\sin(A\pm B)=\sin A.\cos B\pm\cos A\sin B \qquad \cos(A\pm B)=\cos A\cos B\mp\sin A\sin B$$

$$\sin 2A=2\sin A\cos A \qquad \cos 2A=\begin{cases}\cos^2 A-\sin^2 A\\ 2\cos^2 A-1\\ 1-2\sin^2 A\end{cases}$$

$$\sin A.\cos B=\frac{1}{2}[\sin(A+B)+\sin(A-B)]$$

$$\sin A.\sin B=\frac{1}{2}[\cos(A-B)-\cos(A+B)]$$

$$\cos A.\cos B=\frac{1}{2}[\cos(A-B)+\cos(A+B)]$$

Finance & Modelling

$F = P(1+in)$ $\quad F = P(1-in)$ $\quad F = P(1+i)^n$ $\quad F = P(1-i)^n$

$$F = x\left[\frac{(1+i)^n - 1}{i}\right] \qquad P = x\left[\frac{1-(1+i)^{-n}}{i}\right] \qquad r_{eff} = \left(1+\frac{r}{k}\right)^k - 1$$

$$P_{n+1} = P_n + rP_n\left(1-\frac{P_n}{K}\right)$$

$$R_{n+1} = R_n + aR_n\left(1-\frac{R_n}{K}\right) - bR_nF_n \qquad F_{n+1} = F_n + f\,bR_nF_n - cF_n$$

Statistics

$$P(A) = \frac{n(A)}{n(S)} \qquad P(B|A) = \frac{P(B\cap A)}{P(A)} \qquad P(A\cup B) = P(A) + P(B) - P(A\cap B)$$

$$^{n}P_r = \frac{n!}{(n-r)!} \qquad ^{n}C_r = \binom{n}{r} = \frac{n!}{(n-r)!\,r!} \qquad P(X=x) = \binom{n}{x}p^x(1-p)^{n-x}$$

$$P(R=r) = \frac{\binom{p}{r}\binom{N-p}{n-r}}{\binom{N}{n}} \qquad z = \frac{X-\mu}{\sigma} \qquad z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$$

$$z = \frac{\bar{x}-\bar{y}}{\sqrt{\frac{\sigma_x^2}{n_x}+\frac{\sigma_y^2}{n_y}}} \qquad b = \frac{n\sum(xy) - \sum x\sum y}{n(\sum x^2) - (\sum x)^2} \qquad b = \frac{\sum xy - n\overline{xy}}{\sum x^2 - n(\bar{x})^2} \qquad b = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$$

Matrix Transformations

$$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix} \qquad \begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$$