FORMULAE LIST

Standard derivatives		Standard integrals	
$f(x)$	$f'(x)$	$f(x)$	$\int f(x)\,dx$
$\sin^{-1}x$	$\dfrac{1}{\sqrt{1-x^2}}$	$\sec^2(ax)$	$\dfrac{1}{a}\tan(ax)+c$
$\cos^{-1}x$	$-\dfrac{1}{\sqrt{1-x^2}}$	$\dfrac{1}{\sqrt{a^2-x^2}}$	$\sin^{-1}\left(\dfrac{x}{a}\right)+c$
$\tan^{-1}x$	$\dfrac{1}{1+x^2}$	$\dfrac{1}{a^2+x^2}$	$\dfrac{1}{a}\tan^{-1}\left(\dfrac{x}{a}\right)+c$
$\tan x$	$\sec^2 x$	$\dfrac{1}{x}$	$\ln|x|+c$
$\cot x$	$-\operatorname{cosec}^2 x$	e^{ax}	$\dfrac{1}{a}e^{ax}+c$
$\sec x$	$\sec x\tan x$		
$\operatorname{cosec}x$	$-\operatorname{cosec}x\cot x$		
$\ln x$	$\dfrac{1}{x}$		
e^x	e^x		

Summations

(Arithmetic series) $\quad S_n = \dfrac{1}{2}n\left[2a+(n-1)d\right]$

(Geometric series) $\quad S_n = \dfrac{a\left(1-r^n\right)}{1-r}$

$$\sum_{r=1}^{n} r = \frac{n(n+1)}{2}, \quad \sum_{r=1}^{n} r^2 = \frac{n(n+1)(2n+1)}{6}, \quad \sum_{r=1}^{n} r^3 = \frac{n^2(n+1)^2}{4}$$

Binomial theorem

$$(a+b)^n = \sum_{r=0}^{n}\binom{n}{r}a^{n-r}b^r \quad \text{where} \quad \binom{n}{r} = {}^nC_r = \frac{n!}{r!(n-r)!}$$

Maclaurin expansion

$$f(x) = f(0) + f'(0)x + \frac{f''(0)x^2}{2!} + \frac{f'''(0)x^3}{3!} + \frac{f^{iv}(0)x^4}{4!} + \dots$$

De Moivre's theorem

$$\left[r(\cos\theta + i\sin\theta)\right]^n = r^n\left(\cos n\theta + i\sin n\theta\right)$$

Vector product

$$\mathbf{a}\times\mathbf{b} = |\mathbf{a}||\mathbf{b}|\sin\theta\,\hat{\mathbf{n}} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \mathbf{i}\begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} - \mathbf{j}\begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} + \mathbf{k}\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}$$

Matrix transformation

Anti-clockwise rotation through an angle, θ, about the origin, $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

[Turn over