Module : Complex Integration

Evaluation of Integration

Types of function 'f(z)'	Types of contor 'C'	Solving Criterion
f(z) : 'polynomial' (straight forword)	C : 'straight line' or 'parabola'	$z = x+iy$ Put $x=t$ or $y=t$
f(z) : Not involving trignometric, exponential, logarithm	C : circle $\|z\| = r$	put $z = re^{i\theta}$
$f(z) : \frac{p(z)}{(z-z_1)(z-z_2)}$	C : circle ellipse, square	
i) z_1, z_2 Both Not lies inside C	"	Cauchy's theorem $\int_C f(z)\,dz = 0$
ii) z_1 lies inside z_2 not lies inside C	"	cauchy integral formula (OR) cauchy Residue theorem
iii) z_1, z_2 Both lies inside C	"	cauchy integral formula using partial fraction (OR) cauchy Residue theorem
f(z) : involves trignometric, exponential, logarithmic terms	C : circle, ellipse, square	cauchy Residue theorem (if z_0 is singular point then find Residue using laurent's series expansion $z=z_0$)

Taylors or Laurent series Expansion

standard form : $f(z) = \frac{p(z)}{q(z)}$

Step 1. degree of $p(z)$ < degree of $q(z)$

Step 2. $f(z) = \frac{p(z)}{(z-z_1)(z-z_2)}$

Step 3. partial fraction

$$f(z) = \frac{A}{(z-z_1)} + \frac{B}{(z-z_2)}$$

Step 4.

i) $|z| < z_1$ (ROC) , $z_1 < z_2$

ii) $z_1 < |z| < z_2$ (ROC) , $z_1 < z_2$

iii) $|z| > z_2$ (ROC) , $z_1 < z_2$