SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &
Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)
COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF MATHEMATICS

COMPLEX INTEGRATION

Cauchy's integration theorem:

If a function $f(z)$ is analytic and its derivative $f'(z)$ is continuous with all points inside and on a simple closed curve c, then

$$\int_c f(z)\, dz = 0.$$

Cauchy's integral formula:

If $f(z)$ is analytic inside and on a simple closed curve c and 'a' be any point inside c, then

$$\int_c \frac{f(z)}{z-a}\, dz = 2\pi i\, f(a).$$

where integration being taken in the anti-clockwise direction around c.

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DEPATMENT OF MATHEMATICS

① Evaluate $\int_c \dfrac{\cos \pi z}{z-1} dz$, where c is

$|z| = 2$

Soln:

$f(z) = \cos \pi z$

$a = 1$

$c : |z| = 2$.

$a = 1$ lies inside c. $|1| < 2$

By Cauchy's integral formula,

$$\int_c \frac{f(z)}{z-a} dz = 2\pi i f(a)$$

$$\int_c \frac{\cos \pi z}{z-1} dz = 2\pi i f(1) \qquad \left[\because f(z) = \cos \pi z \right.$$

$$= -2\pi i \qquad f(1) = \cos \pi$$

$$= -1 \right]$$

② Evaluate $\int_c \dfrac{dz}{(z-3)^2}$ where c is the

Circle $|z| = 1$

Soln: $a = 3$ lies outside the circle $|z| = 1$.