



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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DEPARTMENT OF MATHEMATICS

① Evaluate $\int_c \frac{\cos \pi z}{z-1} dz$ 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,

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

$$\int_c \frac{\cos \pi z}{z-1} dz = 2\pi i f(1)$$

$$f(1) = \cos \pi$$

$$= -1$$

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

Circle $|z| = 1$

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