

# Unit 4 - Important theorems in complex variables

## Course outline

### How to access the portal?

### Week0

### Introduction to complex variables

### Important theorems in complex variables

● Implications of Cauchy Goursat Theorem, Cauchy Integral Formula.

● Implications of CIF, converse of CG theorem.

● Examples in contour integrals, ratios of polynomials.

● Contour integration of sinc function.

● Method of path deformation.

● Method of path deformation. Continued

○ Quiz : Week2 Assessment

○ Week2 Assessment Solution

### Branch cuts of the square root function

### The inverse Laplace transform

## Week2 Assessment

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2019-08-21, 23:59 IST.**

1) One of the roots of  $f(z) = z^4 + 5z^2 + 4$  is

1 point

- $4i$   
  $i$   
  $4$   
  $1$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $i$

2) The order of the pole at  $z = 0$ , for the function  $f(z) = \frac{1+e^{2z}}{z^3}$  is

1 point

- $0$   
  $1$   
  $2$   
  $3$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $3$

3) The order of the pole at  $z = 1$ , for the function  $f(z) = \frac{(z^2-1)+\sin(z-1)}{(z-1)}$  is

1 point

- $2$   
  $1$   
  $0$   
 None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $0$

4) Let us consider a function  $f(x)$ , such that  $f(-x) = f(x)$ , where  $f(x)$  is analytic in  $x \in (-\infty, \infty)$ . The value of  $\int_{-\infty}^{\infty} f(x) dx$  equals to

1 point

- $2 \int_0^{\infty} f(x) dx$   
  $2 \int_{-\infty}^{\infty} f(x) dx$   
  $0$   
 None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $2 \int_0^{\infty} f(x) dx$

5) Let us consider a function  $f(x)$ , such that  $f(-x) = -f(x)$ , where  $f(x)$  is analytic in  $x \in (-\infty, \infty)$ . The value of  $\int_{-\infty}^{\infty} f(x) dx$  equals to

1 point

- $2 \int_0^{\infty} f(x) dx$   
  $2 \int_{-\infty}^{\infty} f(x) dx$   
  $0$   
 None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $0$

6) The residue of the function  $f(z) = \frac{(z^2-1)-\sin(z-1)}{(z-1)}$  at  $z = 1$  equals to

0 points

- $0$   
  $-1$   
  $2$   
  $1$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $1$

7) The residue of the function  $f(z) = \frac{1}{\sin(z)}$  at  $z = 0$  equals to

1 point

- $1$   
  $-1$   
  $0$   
  $1/2$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $1$

8) The residue of the function  $f(z) = \frac{\tanh(z)}{z^2}$  at  $z = i\pi/2$  equals to

1 point

- $4/\pi^2$   
  $-4/\pi^2$   
  $i\pi^2/4$   
  $-i\pi^2/4$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $-4/\pi^2$

9) Let us consider  $J = \oint_C f(z) dz$ , where  $C$  is the unit circle with centre at the origin and  $f(z) = \frac{1}{2z-1}$ . The value of  $J$  is equal to

1 point

- $-2\pi i$   
  $2\pi i$   
  $-\pi i$   
  $\pi i$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\pi i$

10) Let us consider  $J = \oint_C f(z) dz$ , where  $C$  is the unit circle with centre at the origin and  $f(z) = \frac{e^z}{z^2 - \frac{1}{4}}$ . The value of  $J$  is equal to

1 point

- $2\pi i \sin(\frac{1}{2})$   
  $4\pi i \sin(\frac{1}{2})$   
  $4\pi i \sinh(\frac{1}{2})$   
  $2\pi i \sinh(\frac{1}{2})$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $4\pi i \sinh(\frac{1}{2})$