*

The value of $\oint_C \frac{z^2}{(z-2)^2} dz$ where C is the circle $|z| = 3$ is

a. 0

b. $2\pi i$

c. $4\pi i$

d. $8\pi i$

- a
- b
- c
- d

*

The zero's of $f(z) = \frac{z^2+1}{1-z^2}$ are

a. 0

b. $\pm i$

c. ± 1

d. 1

- ○ a
- ○ b
- ◉ c
- ○ d

*

The annular region for the function $f(z) = \frac{1}{z^2 - z - 6}$ is

a. $0 < |z| < 1$

b. $1 < |z| < 2$

c. $2 < |z| < 3$

d. $|z| < 3$

- ○ a
- ○ b
- ◉ c
- ○ d

*

The invariant point of the transformation $w = \frac{1}{z+2i}$ is

a. $z = i$

b. $z = -i$

c. $z = 1$

d. $z = -1$

- ( ) a
- (•) b
- ( ) c
- ( ) d

*

A single valued continuous function $f(z) = u + iv$ is analytic in a region R if it satisfy the C-R equations at each point and also possess one of the following

a. $u_x = v_y$

b. $v_x = u_y$

c. continuousu_x, u_y in a region R

d. continuous u_x, u_y, v_x, v_y at each point of the region R

- a
- b
- c
- d

*

If the integral $\oint_0^{2\pi} \frac{d\theta}{5+3\cos\theta} = \oint_C f(z)dz$, C is $|z| = 1$, then
(A) $z = -\frac{1}{3}$ lies inside C and
(B) $z = 3$ lies outside C. Which of the following is true.

a. Both A and B

b. Only A

c. Only B

d. Neither A nor B

- a
- b
- c
- d

*

The bilinear transformation that maps the points $z = 0,1,\infty$ into the points $w = -5, -1, 3$ respectively is

a. $w = \frac{3z-5}{z-1}$

b. $w = \frac{3z-5}{z+1}$

c. $w = \frac{2z+5}{z+1}$

d. $w = \frac{z-5}{z+1}$

- ○ a
- ○ b
- ◉ c
- ○ d

*

Let $z = a$ is a simple pole for $f(z)$ and $b = \lim_{z \to a}(z-a)f(z)$, then

a. b is a simple pole

b. b is removable singularity

c. b is a residue at a of order n

d. b is a residue at $z = a$

- ○ a
- ○ b
- ○ c
- ◉ d

*

Find an analytic function $f(z)$ whose real part is $u = e^x \, siny$

a. $e^z + c$

b. $- e^z + c$

c. $-(1+i)e^z + c$

d. $-ie^z + c$

- ( ) a
- ( ) b
- ( ) c
- (•) d

*

Under the mapping $w = \frac{1}{z}$, the image of $|z| \leq 1$ is

a. $|w| \geq 1$

b. $|w| = 1$

c. $|w| > 1$

d. $|w - 1| = 1$

- (selected) a
- b
- c
- d

*

If $f(z) = \frac{-1}{(z-1)} - 2[1 + (z-1) + (z-1)^2 + ...]$ then the residue of $f(z)$ at $z = 1$ is

a. 1

b. -1

c. 0

d. -2

- ( ) a
- (•) b
- ( ) c
- ( ) d

*

If $w = z + \frac{1}{z}$ then $\frac{dw}{dz}$ is

a. $1 + \frac{1}{z^2}$

b. $1 - \frac{1}{z^2}$

c. $1 + \frac{1}{z}$

d. $1 - \frac{1}{z}$

- [ ] a
- [x] b
- [ ] c
- [ ] d

*

The mapping $w = z + c$ gives

a. Translation

b. Rotation

c. inversion

d. reflection

- (selected) a
- b
- c
- d

*

The value of $\oint_C \frac{e^{-z}}{z+1} dz$ where C is the circle $|z| = \frac{1}{3}$ is

a. 0

b. $2\pi ie$

c. $\frac{\pi}{2} ie$

d. πie

- (selected) a
- b
- c
- d

*

The Laurent's series expansion $-\frac{1}{2}\sum\frac{(z+2)^n}{4^n} - \sum\frac{3^n}{(z+2)^n}$ for the function $f(z) = \frac{z}{(z-1)(z-2)}$ is valid in the region

a. $|z+2| < 3$

b. $1 < |z+2| < 2$

c. $3 < |z+2| < 4$

d. $|z+2| > 4$

- a
- b
- c
- d

*

Let $C_1: |z-a| = R_1$ and $C_2: |z-a| = R_2$ be two concentric circles $(R_2 < R_1)$, the annular region is defined as

a. Within C_1

b. Within C_2

c. Within C_2 and outside C_1

d. Within C_1 and outside C_2

- a
- b
- c
- d

*

If $f(z)$ is analytic inside and on C, then the value of $\oint_C \frac{f(z)}{(z-a)^5}dz$, where C is the simple closed curve and a is any point within C is

a. $2\pi i \frac{f^{v}(a)}{5!}$

b. $2\pi i\, f(a)$

c. $2\pi i \frac{f^{iv}(a)}{4!}$

d. 0

- [ ] a
- [x] b
- [ ] c
- [ ] d

*

The region in which $f(z) = (x-y)^2 + 2i\,(x+y)$ is analytic

a. $x + y = 1$

b. $x = 1$

c. $x - y = 1$

d. $y = 1$

- a
- b
- c
- d

*

Let $C: |z-a| = r$ be a circle, the $f(z)$ can be expanded as a Taylor's series if

a. $f(z)$ is a function on C

b. $f(z)$ is an analytic function within C

c. $f(z)$ is not an analytic function within C

d. $f(z)$ is an analytic function outside C

- a
- b (selected)
- c
- d

*

The value of the integral $\oint_C e^z dz$ where $|z| = 1$ is

a. $2\pi i$

b. $\frac{\pi}{2} i$

c. πi

d. 0

- a
- b
- c
- d

*

$$\nabla^2 \{ \log |f(z)| \} =$$

a. 2

b.0

c. 1

d. 3

- a
- b
- c
- d

*

The value of $\oint_C \frac{e^{2z}}{(z+1)^3} dz$ where C is the circle $|z| = 2$ is

a. 0

b. $2\pi i e^{-2}$

c. $8\pi i e^{-2}$

d. $4\pi i e^{-2}$

- ( ) a
- ( ) b
- ( ) c
- ( ) d

*

If $f(z)$ is not analytic at $z = z_0$ and there exists $\lim_{z \to z_0} f(z)$ and is finite then

a. The point $z = z_0$ is isolated singularity of $f(z)$

b. The point $z = z_0$ is a removable singularity of $f(z)$

c. The point $z = z_0$ is essential singularity of $f(z)$

d. The point $z = z_0$ is non isolated singularity of $f(z)$

- (x) a
- ( ) b
- ( ) c
- ( ) d

*

Critical point of the map $w^2 = (z-\alpha)(z-\beta)$ are

a. $z = \frac{1}{2}(\alpha+\beta)$

b. $z = \frac{\alpha\beta}{2}$

c. $z = (\alpha+\beta)$

d. $z = \frac{1}{2}(\alpha-\beta)$

- a
- b
- c
- d

*

If $\oint_C \frac{e^z}{z^2} dz = 0$, then C is

a. $|z| = 1$

b. $|z - 1| = 2$

c. $|z - 2| = 1$

d. $|z| = 2$

- a
- b
- c
- d

*

The invariant points of the transformation $w = \frac{2z-5}{z+4}$ are

a. $z = \pm i$

b. $-1 \pm 2i$

c. $1 \pm 2i$

d. $-1 \pm i$

- a
- b
- c
- d

*

Let $z = a$ is a pole of order m for $f(z)$, then the residue is

a. $\lim\limits_{z \to a}[(z - a)f(z)]$

b. $\lim\limits_{z \to a}[(z - a)f''(z)]$

c. $\lim\limits_{z \to a} \frac{1}{(m-1)!} \frac{d^{m-1}}{dz^{m-1}} [(z - a)^m f(z)]$

d. $\lim\limits_{z \to a} \frac{1}{m!} \frac{d^m}{dz^m} [(z - a)^m f(z)]$

- a
- b
- c
- d

*

The points at which the function $f(z) = \frac{1}{1+z^2}$ fails to be analytic are

a. $z = \pm 1$

b. $z = \pm i$

c. $z = \pm 2$

d. $z = 1$

- a
- b
- c
- d

*

The value of $\oint_C \frac{1}{2z-3} dz$ where C is the circle $|z| = 1$ is

a. 0

b. $2\pi i$

c. $\frac{\pi}{2} i$

d. πi

- ○ a
- ○ b
- ○ c
- ◉ d

*

Find the analytic function $f(z)$ where $v = x^4 - 6x^2y^2 + y^4$

a. $iz^4 + c$

b. $iz^3 + c$

c. $-iz^4 + c$

d. $-iz^3 + c$

- a
- b
- c
- d

*

If $u(x, y)$ is a real part of analytic function and satisfies $u_{xx} + u_{yy} = 0$, then u is

a. Harmonic

b. Analytic

c. Differentiable

d. continuous

- (selected) a
- b
- c
- d

*

The residue of $f(z) = \frac{z}{z^2+1}$ at $z = i$ is

a. 1

b. -1

c. 0

d. 1/2

- a
- b
- c
- (selected) d

*

Expansion of $\frac{\sin z}{(z-\pi)}$ in Taylor's series about $z = \pi$ is

a. $\frac{(z-\pi)}{1!} - \frac{(z-\pi)^3}{3!} + \frac{(z-\pi)^5}{5!} - \ldots$

b. $\frac{(z-\pi)^2}{2!} - \frac{(z-\pi)^4}{4!} + \frac{(z-\pi)^6}{6!} - \ldots$

c. $-1 + \frac{(z-\pi)^2}{3!} - \frac{(z-\pi)^4}{5!} + \ldots$

d. $\frac{(z-\pi)}{2!} + \frac{(z-\pi)^3}{4!} - \frac{(z-\pi)^5}{6!} + \ldots$

- a
- b
- c
- d

*

The critical points of the transformation $w = \frac{1}{2}\left(z + \frac{1}{z}\right)$

a. $z = \pm 1$

b. $z = \pm i$

c. $z = \pm 2$

d. $z = 1$

- a
- b
- c
- d

*

In Cauchy's Lemma for contour integration, if $f(z)$ be continuous function such that $|zf(z)| \to 0$ as $|z| \to \infty$, for C is the circle $|z| = R$, then

a. $\oint_C f(z)dz \to \infty \ as \ R \to \infty.$

b. $\oint_C f(z)dz \to 0 \ as \ R \to \infty.$

c. $\oint_C f(z)dz \to 0 \ as \ R \to 0.$

d. $\oint_C f(z)dz \to \infty \ as \ R \to 0.$

- [ ] a
- [x] b
- [ ] c
- [ ] d

*

If $u + iv$ is analytic then $v - iu$ is

a. analytic

b. not analytic

c. analytic only at the origin

d. analytic expect at the origin

- a
- b
- c
- d

*

If $f(z) = u + iv$ is analytic at a point then which of the following is not true?

a. $u_x = v_y$ at the point

b. $u_y =- v_x$ at the point

c. $u_{xx} + u_{yy} \neq 0$ at the point

d. u_x, u_y, v_x, v_y are continuous at the point

- ○ a
- ○ b
- ◉ c
- ○ d

*

If $f(z) = u + iv$ is an analytic function of z then the Cauchy Riemann equations is

a. $u_x = v_{y,}\, u_y = v_x$

b. $u_x = v_{y,}\, u_y = -v_x$

c. $u_x = -v_{y,}\, u_y = -v_x$

d. $u_x = -v_{y,}\, u_y = v_x$

- ○ a
- ◉ b
- ○ c
- ○ d

*

If $f(z)$ is analytic inside and on C, then the value of $\oint_C \frac{f(z)}{z-a}dz$, where C is the simple closed curve and a is any point within C is

a. $f(a)$

b. $2\pi i f(a)$

c. $\pi i f(a)$

d. 0

- a
- b
- c
- d

*

The bilinear transformation which maps the points $\infty, i, 0$ into $0, i, \infty$ respectively is

a. $w = z$

b. $w = -z$

c. $w = -\frac{1}{z}$

d. $w = \frac{1}{z}$

- a
- b
- c
- d

*

If $f(z) = r^2(cos2\theta + isinp\theta)$ is analytic, then the value of p is

a. $\frac{1}{2}$

b. 0

c. 2

d. 1

- ○ a
- ○ b
- ◉ c
- ○ d

*

$f(z) = |z|^2$ is analytic at

a. at the origin

b. at infinity

c. at all points of z-plane

d. nowhere

- [ ] a
- [ ] b
- [ ] c
- [x] d

*

$w = log\, z$ is

a. analytic at all points

b. not analytic at the origin

c. nowhere analytic

d. analytic at infinity

- [ ] a
- [x] b
- [ ] c
- [ ] d

*

Construction of an analytic functions $f(z)$ when real part is given using Milne's Thomson method $u_x = \phi_1(x,y), u_y = \phi_2(x,y)$, $v_x = \Psi_2(x,y), v_y = \Psi_1(x,y)$

a. $f(z) = \int [\phi_1(z,0) - i\phi_2(z,0)]dz + c$

b. $f(z) = \int [\phi_1(z,0) + i\phi_2(z,0)]dz + c$

c. $f(z) = \int [\Psi_1(z,0) + i\Psi_2(z,0)]dz + c$

d. $f(z) = \int [\Psi_1(z,0) - i\Psi_2(z,0)]dz + c$

- [x] a
- [ ] b
- [ ] c
- [ ] d

*

The residue of $f(z) = \frac{z}{(z-1)^2}$ at $z = 1$ is

a. π

b. 1

c. -1

d. 0

- a
- b
- c
- d

*

The part $\sum_{n=1}^{\infty} b_n(z-a)^{-n}$ consisting of negative integral powers of $(z-a)$ is called as

a. The analytic part of the Laurent's series

b. The principal part of the Laurent's series

c. The real part of the Laurent's series

d. The imaginary part of the Laurent's series

- [ ] a
- [x] b
- [ ] c
- [ ] d

*

If $f(z) = \frac{sinz}{z}$, then

a. $z = 0$ is a simple pole

b. $z = 0$ is a pole of order 2

c. $z = 0$ is a removable singularity

d. $z = 0$ is a zero of $f(z)$

- ○ a
- ○ b
- ◉ c
- ○ d

*

If $f(z)$ is analytic with the real part $e^x\, cosy$ then $f^{'}(z)$ is equal to

a. $cosz$

b. $-e^z$

c. e^z

d. $sinz$

- a
- b
- c
- d

*

A continuous curve which does not have a point of self-intersection is called a

a. Curve

b. Closed curve

c. Simple closed curve

d. Multiple curve

- ◯ a
- ◯ b
- ◉ c
- ◯ d

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