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Test 1 on MSp
2023

Test nr. 1 consists of 20 questions, and it will last 10 minutes.

Please read all problems carefully. Answer by selecting the best option.

Recall that one choice might be very wrong and counts -1.

Make sure you answer all questions.

No discussions and helping your colleagues are allowed as well as using any electronic device.

Question 1

The set of points z satisfying the following condition $|z - i + 3| = 5$ is described by:

A. Circle of radius 5 centered at $i - 3$.

B. Complement of the closed disc of radius 5 centered at $i - 3$.

C. Closed disc of radius 5 is centered at $i - 3$.

D. Closed disc of radius 1 is centered at $-2i$.

Question 2

The set of points z satisfying the following condition $|z - i + 3| > 5$ is described by:

A. Circle of radius 5 centered at $i - 3$.

B. Complement of the closed disc of radius 5 centered at $i - 3$.

C. Closed disc of radius 5 is centered at $i - 3$.

D. Closed disc of radius 1 is centered at $-2i$.

Question 3

The set of points z satisfying the following condition $|z - i + 3| \leq 5$ is described by:

A. Circle of radius 5 centered at $i - 3$.

B. Complement of the closed disc of radius 5 centered at $i - 3$.

C. Closed disc of radius 5 is centered at $i - 3$.

D. Closed disc of radius 1 is centered at $-2i$.

Question 4

The set of points z satisfying the following condition $|z + 2i| \leq 1$ is described by:

A. Circle of radius 5 centered at $i - 3$.

B. Complement of the closed disc of radius 5 centered at $i - 3$.

C. Closed disc of radius 5 is centered at $i - 3$.

D. Closed disc of radius 1 is centered at $-2i$.

Question 5

The set of points z satisfying the following condition $\operatorname{Im} z > 0$ is described by:

A. Open upper half plane.

B. Closed upper half plane.

C. Open right half plane.

D. Closed right half plane.

Question 6

The set of points z satisfying the following condition $\operatorname{Re} z > 0$ is described by:

A. Open upper half plane.

B. Closed upper half plane.

C. Open right half plane.

D. Closed right half plane.

Question 7

The set of points z satisfying the following condition $\operatorname{Im} z \geq 0$ is described by:

A. Open upper half plane.

B. Closed upper half plane.

C. Open right half plane.

D. Closed right half plane.

Question 8

The set of points z satisfying the following condition $\operatorname{Re} z \geq 0$ is described by:

A. Open upper half plane.

B. Closed upper half plane.

C. Open right half plane.

D. Closed right half plane.

Question 9

The domain of the function $f(z) = \dfrac{z}{z+\bar{z}}$ is:

A. $\operatorname{Im} z \neq 0$

B. $\operatorname{Re} z \neq 0$

C. $\operatorname{Im} z = 0$

D. $\operatorname{Re} z = 0$

Question 10

The domain of the function $f(z) = \dfrac{z}{z - \bar{z}}$ is:

A. $\operatorname{Im} z \neq 0$

B. $\operatorname{Re} z \neq 0$

C. $\operatorname{Im} z = 0$

D. $\operatorname{Re} z = 0$

Question 11

The domain of the function $f(z) = \dfrac{2}{z \cdot \overline{z}}$ is:

A. $\operatorname{Im} z \neq 0$

B. $\operatorname{Re} z \neq 0$

C. $|z| \neq 0$

D. $z \neq 0$

Question 12

The domain of the function $f(z) = \dfrac{\overline{z}}{z}$ is:

A. $\operatorname{Im} z \neq 0$

B. $\operatorname{Re} z \neq 0$

C. $|z| \neq 0$

D. $z \neq 0$

Question 13

How many values has the expression 1^i?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 14

How many values has the expression $e^{2n\pi i}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 15

How many values has the expression $\sqrt{1}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 16

How many values has the expression $e^{\pi i}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 17

How many values has the expression 1^2?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 18

How many values has the expression $e^{\frac{2\pi i}{n}}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 19

How many values has the expression $\sqrt[n]{1}$?

A. one single value

B. two values

C. exactly n values

D. infinitely many values

Question 20

Determine the validity of the statements:

a) The complex function $f(z) = z^2$ is continuous for all z.

b) The complex exponential function is periodic.

c) The complex function $f(z) = i\sqrt[3]{xy}$ is differentiable at $z = 0 + 0i$.

d) The complex function $f(z) = |z|$ is continuous for all z.

A. *a* and *b* are true

B. *a*, *b* and *c* are true

C. *a*, *b* and *d* are true

D. *a* and *d* are true