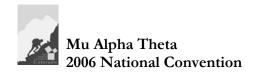


1)	Simplify: $(3+i)+(9-3i)-2(7+4i)$					
	A) $-2-10i$	B) $-2 + 6i$	C) 5 – 6 <i>i</i>	D) 5+10 <i>i</i>	E) NOTA	
2)	Simplify: $(3 + i)(2 - 3i)$					
	A) 3-7 <i>i</i>	B) 9-7 <i>i</i>	C) 6 – 3 <i>i</i>	D) 6+11 <i>i</i>	E) NOTA	
3)	Simplify: $\frac{3+i}{2-3i}$					
	2 31	B) $\frac{3}{13} - \frac{11}{13}i$	C) $\frac{9}{13} + \frac{7}{13}i$	D) $\frac{3}{13} + \frac{11}{13}i$	E) NOTA	
4)	If $(6-6i\sqrt{3})^5 = a+bi$ where a and b are real numbers, then find the ratio $\frac{a}{b}$.					
	A) $-\sqrt{3}$	$B) - \frac{\sqrt{3}}{3}$	C) $\frac{\sqrt{3}}{3}$	D) $\sqrt{3}$	E) NOTA	
5)						
	A) $12 + 2\sqrt{2}$	B) $14 - \sqrt{2}$	C) $-3\sqrt{2}$	D) 12	E) NOTA	
6)	What is the imaginary part of $(1+i)^2 \cdot e^{-i\pi/4}$?					
	A) $-2\sqrt{2}$	B) $-\sqrt{2}$	C) $\sqrt{2}$	D) $2\sqrt{2}$	E) NOTA	
7)	Two complex numbers, z_1 and z_2 satisfy the two following properties: $z_1 + z_2$ is purely imaginary, and $z_1^2 + z_2^2$ is real. Both z_1 and z_2 have non-zero real and imaginary parts. For the two properties to hold, which of the following statement(s) MUST be true? I.) $z_1 = \overline{z_2}$ II.) $z_1 - z_2$ is purely real. III.) z_1 cannot be equal to z_2 IV.) $ z_1 = z_2 $					
	A) I. and II. only	B) II. and IV. only	C) II., III., and IV.	D) All are true	E) NOTA	
8)	There are two complex zeros of the function $f(z)=z^2+2z+16$, z_1 and z_2 . What is the sum of the squares of z_1 and z_2 ?					
	squares of z_1 and z_2 A) -28	B) -15	C) 0	D) 32	E) NOTA	

E) NOTA

D) All are true

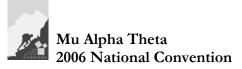


A) I. only

9)	Complex numbers can be thought of as vectors in the complex plane. What is the angle that the vector starting at $3-i$ and ending at $-1+3i$ makes with the positive x-axis?					
	A) 45°	B) 135°	C) 225°	D) 315°	E) NOTA	
10) The sum $1 + (1-i) + (1-i)^2 + (1-i)^3$ can be represented in the form $a + bi$ where a and b are real value Find $ a-b $.						
	A) 1	B) 3	C) 5	D) 7	E) NOTA	
11)	_	ng is NOT a sixth root B) $\frac{\sqrt{3}}{2} + \frac{1}{2}i$	· —	D) –1	E) NOTA	
	A) $\frac{1}{2} - \frac{1}{2}i$	B) $\frac{1}{2} + \frac{1}{2}t$	$C) - \frac{1}{2} - \frac{1}{2}i$	D) =1	E) NOTA	
12) How many of the following are NOT complex numbers? I.) 0 II.) $2i - 2$ III.) $8i$ IV.) $-\sqrt{2}$						
	A) 1	B) 2	C) 3	D) 4	E) NOTA	
13) Which of the following is NOT a fifth root of $z = 16\sqrt{2} + 16i\sqrt{2}$?						
	A) 2cis(9°)	B) 2cis(81°)	C) 2cis(189°)	D) 2cis(297°)	E) NOTA	
14) Find the value of $f(2+i)$ if $f(z)=iz^3+2z^2-3z^2+2i$.						
	A) $-11+15i$	B) $-11+9i$	C) $2 + 18i$	D) $2 + 24i$	E) NOTA	
 15) Let the complex number z₁ = a + bi where a and b are positive real numbers. Let the complex number z₂ = z₁². Which of the following statement(s) MUST be true? I.) z₂ = z₁ ² II.) The angle that z₁ makes with the positive real axis is half the angle at which z₂ makes with the positive real axis. III.) If z₂ = c + di, then both c and d are positive. IV.) 1/z₂ = z₁/ z₁ ² 						

C) I. and IV. only

B) I. and II. only



16)	Simplify:	$\frac{1}{i} + \frac{2}{i^2} + \frac{3}{i^3} + \frac{4}{i^4}$					
	A) 4	B) 1+i	C) $2 + 2i$	D) 4+6 <i>i</i>	E) NOTA		
17) What is the norm of the complex number $-6-8i$?							
	A) –100	B) –10	C) 10	D) 100	E) NOTA		
18)	8) Evaluate: $i^6 + i^{29} + i^{2006}$						
	A) –3 <i>i</i>	B) – <i>i</i>	C) 1+2 <i>i</i>	D) $-2+i$	E) NOTA		
19)	Evaluate:	$\prod_{k=0}^{2N} i^k \text{ where } N \text{ is an}$	n integer. Leave your answ	ver in terms of N.			
	A) i^{-N}	B) $i^{-N/2}$	C) <i>i</i> ^N	D) i^{2N}	E) NOTA		
20)	Evaluate the sum:	$\sum_{k=0}^{2006} (-i)^k$					
	A) 1	B) <i>i</i>	C) – i	D) 1-i	E) NOTA		
21) What is the real part of the following product? $(5-6i)(2i+1)$							
	A) –7	B) –3	C) 4	D) 17	E) NOTA		
22) Which of the value(s) for x makes the determinant equal to zero? $\begin{vmatrix} x & -1 & 2 \\ 0 & i & 2 \\ -x & i & 2i \end{vmatrix}$							
	I.) –1	II.) 0	III.) i	IV.) -i	V.) 1		
	A) II. only B) I	., II., and V. only	C) III. and IV. only	D) All of these	E) NOTA		

23) Dave rips a piece of paper into four identical squares. He then takes the four numbers: 5*i*, -2, 300, and -2006 + 2007*i*, and writes one on each square paper. He puts all four squares of paper into a hat, shuffles them around, and randomly draws 2 squares without replacement. What is the probability that the product of the two numbers he draws is a real number?

A) $\frac{1}{12}$

 $B) \frac{1}{6}$

 $C) = \frac{1}{2}$

D) $\frac{1}{2}$

E) NOTA

24) What is the sum of the complex zeros to the quadratic function $y = x^2 - 2x + 9$?

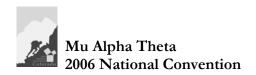
A) -9

B) -2

C) 2

D) 9

E) NOTA



- 25) A multiplication by -i in the complex plane does what to a complex number, z = x + iy?
 - A) It rotates it 90° clockwise
 - B) It rotates it 90° counter-clockwise
 - C) It flips it across the y-axis
 - D) It flips it across the x-axis
 - E) NOTA
- $\sum_{n=0}^{3} n \cdot i^{n}$ 26) Evaluate the sum:
 - A) 2 + 3i
- B) 3 2i
- C) -2-3i
- D) 3 + 2i
- E) NOTA
- 27) How many of the following statements are true regarding the complex function f(z)=|z|?
 - I.) f(-z) = f(z)
- II.) $f(\overline{z}) = f(z)$
 - III.) f(z) is always real
- IV.) If f(z)=0, then z can only be equal to 0.

V.) $f(z^2) = [f(z)]^2$

- A) 1
- B) 2
- C) 3

- D) 4
- E) NOTA
- 28) Two of the roots of a fifth order polynomial with integer coefficients, P(x), are $z_1 = 5 6i$ and $z_2 = 2 + 3i$. Which of the following statement(s) MUST be true regarding P(x)?
 - I.) P(x) has only 1 real root
 - II.) z = -5 6i is a root of P(x)
 - III.) z = 2 3i is a root of P(x)
 - IV.) The product of all five roots of P(x) is a real number.
 - A) IV. only
- B) I. and II. only
- C) I. and III. only
- D) I., III., and IV. only
- E) NOTA

- 29) Simplify: $\sqrt{-2} \times \sqrt{-8} \times \sqrt{-16}$
 - A) -16i
- B) 8i
- C) 8*i*

- D) 16i
- E) NOTA

30) What is the solution to the system of linear equations shown below?

$$x - iy + 2iz = -1$$

$$ix + 2y + (2 - i)z = 3i$$

$$x + z = 1$$

$$A) \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 \\ 4i \\ 0 \end{bmatrix}$$

$$\mathbf{B}) \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 2 - i \\ 1 \end{bmatrix}$$

A)
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 \\ 4i \\ 0 \end{bmatrix}$$
B)
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 2-i \\ 1 \end{bmatrix}$$
C)
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -11+i \\ 1+8i \\ -i \end{bmatrix}$$
D)
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1-i \\ -1 \\ i \end{bmatrix}$$

$$D) \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 - i \\ -1 \\ i \end{bmatrix}$$

E) NOTA