1.5

Complex Numbers

1) If $\sqrt{-4}\sqrt{-9} + 2i^{99} - \sqrt[3]{-27} = a + b\,i$, where $i = \sqrt{-1}$, then $a + b =$

A) -5

B) -11

C) 5

D) 11

E) 7

2) If a is the **real part** and b is the **imaginary part** of the complex number $z = \dfrac{(3-4i)(3+4i)}{10-5i}$, where $i = \sqrt{-1}$, then $a + b =$

A) 3

B) 15

C) 5

D) 1

E) -5

3) The **standard form** of the complex number $\dfrac{2-3i}{1-2i} + \dfrac{\sqrt{-36}}{\sqrt{-4}\,\sqrt{-9}}$, is

A) $\frac{8}{5} - \frac{4}{5}i$

B) $\frac{3}{5} + \frac{4}{5}i$

C) $\frac{1}{5} - \frac{2}{5}i$

D) $\frac{4}{5} - \frac{3}{5}i$

E) $\frac{6}{5} + \frac{4}{5}i$

4) The **sum** of the **real** and **imaginary** parts of the complex number

$(1 - 2i)\,(\sqrt{-4} - \sqrt[3]{-27}\,) + i^{11}$, is equal to

A) 2

B) 4

C) 8

D) 10

E) 12

5) The **conjugate** of the complex number $(2 - 3i)^{-1}$ is

A) $\frac{2}{13} - \frac{3}{13}i$

B) $\frac{2}{13} + \frac{3}{13}i$

C) $\frac{1}{2} + \frac{1}{3}i$

D) $\frac{1}{2} - \frac{1}{3}i$

E) $-\frac{2}{5} + \frac{3}{5}i$

6) If $a \pm bi$ are the **nonreal** complex solutions of the equation $x^3 + 1 = 0$,

then $a \cdot b =$

A) $\frac{\sqrt{3}}{4}$

B) 1

C) $\frac{\sqrt{3}}{2}$

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

E) $\frac{1}{4}$

7) If $z = -\sqrt{-2^2} + \dfrac{1-3i}{1+i}$, where $i = \sqrt{-1}$, then the **conjugate** of z is

A) $-1+4i$

B) $1-4i$

C) $1+4i$

D) -1

E) 1

8)If $i(3-2i)^2 = x + yi$, where x and y are real numbers, then the value of $x-y$ is equal to:

(a) 7
(b) –7
(c) 19
(d) –19
(e) 5

9)If $z = i$, then $z^{1001} + 2z^{1000} + 3z^{999} + 4z^{998} =$

(a) $-2-2i$
(b) $-2+2i$
(c) $2-2i$
(d) $2-i$
(e) $3+2i$

10)If $i=\sqrt{-1}$ and $z=1+i\sqrt{3}$, then $\frac{1}{i}\left(z^2-2z\right)$ is equal to

(a) $4i$
(b) $-2+3i$
(c) $-3i$
(d) $1-3i$
(e) $6i$

11)If $i=\sqrt{-1}$ and $z=\frac{7-3i}{1+i}-i^{51}$, then the **conjugate** of z in standard form is

(a) $\bar{z}= \ 2+4i$
(b) $\bar{z}= \ 2-2i$
(c) $\bar{z}=-2-4i$
(d) $\bar{z}=-2+4i$
(e) $\bar{z}= \ 2-4i$

12)The expression $\left(\sqrt{-2}+\sqrt{-3}\right)\left(\sqrt{-8}-\sqrt{-27}\right)+\frac{1}{i^{86}}$ simplifies to

(a) $4+\sqrt{6}$
(b) $-4+\sqrt{5}$
(c) $-3+\sqrt{6}$
(d) $4+\sqrt{6}i$
(e) $4-\sqrt{6}$

13)The sum of the real part and the imaginary part of the complex number $\frac{\sqrt{-4}\left(\sqrt[3]{-27}-\sqrt{-16}\right)}{(1+i)^2}$ is equal to

(a) -7

(b) -1

(c) 1

(d) $4i$

(e) -2

14)If $i(3-2i)^2 = x + yi$, where x and y are real numbers, then the value of $x - y$ is equal to:

(f) 7

(g) -7

(h) 19

(i) -19

(j) 5

15)If $z = i$, then $z^{1001} + 2z^{1000} + 3z^{999} + 4z^{998} =$

(f) $-2-2i$

(g) $-2+2i$

(h) $2-2i$

(i) $2-i$

(j) $3+2i$

16)If $i = \sqrt{-1}$ and $z = 1 + i\sqrt{3}$, then $\frac{1}{i}\left(z^2 - 2z\right)$ is equal to

(f) $4i$

(g) $-2+3i$

(h) $-3i$

(i) $1-3i$

17)If $i=\sqrt{-1}$ and $z=\dfrac{7-3i}{1+i}-i^{51}$, then the **conjugate** of z in standard form is

(f) $\bar{z}=\ \ 2+4i$
(g) $\bar{z}=\ \ 2-2i$
(h) $\bar{z}=-2-4i$
(i) $\bar{z}=-2+4i$
(j) $\bar{z}=\ \ 2-4i$

18)The expression $\left(\sqrt{-2}+\sqrt{-3}\right)\left(\sqrt{-8}-\sqrt{-27}\right)+\dfrac{1}{i^{86}}$ simplifies to

(f) $4+\sqrt{6}$
(g) $-4+\sqrt{5}$
(h) $-3+\sqrt{6}$
(i) $4+\sqrt{6}i$
(j) $4-\sqrt{6}$

19)The sum of the real part and the imaginary part of the complex number $\dfrac{\sqrt{-4}\left(\sqrt[3]{-27}-\sqrt{-16}\right)}{(1+i)^2}$ is equal to

(f) -7
(g) -1
(h) 1
(i) $4i$
(j) -2

20) One of the nonreal complex solutions of the equation $x^3-8=0$ is

(A) $-1+\sqrt{3}\,i$

21) The conjugate of $i^5\left(\frac{-4-39i}{5-2i}\right)$ is

A) $7-2i$

22) The expression $(\sqrt{-2}+\sqrt{-3})(\sqrt{-8}-\sqrt{-27})+\frac{1}{i^{86}}$ simplifies t

A) $-3+\sqrt{6}$

B) $4+\sqrt{6}$

C) $4+\sqrt{6}i$

D) $-4+\sqrt{5}$

E) $4-\sqrt{6}$

23) The expression $(3-2i)^2(1-3i)+\sqrt[3]{-8}\sqrt{-9}$ simplifies to

A) $-31-33i$

24) The conjugate of $\frac{3+2i}{5-i}$ is

A) $\frac{1}{3}-\frac{1}{3}i$

B) $\frac{1}{2}+\frac{1}{2}i$

C) $\frac{1}{5}-\frac{1}{5}i$

D) $\frac{1}{5}+\frac{1}{5}i$

E) $\frac{1}{2}-\frac{1}{2}i$

25) The **conjugate** of the complex number $\dfrac{8+i^7}{2+3i^{13}}$ in standard form is

~~(a)~~ $1+2i$

26) If $i=\sqrt{-1}$ and $z=1+i\sqrt{3}$, then the expression $\dfrac{1}{i}(z^2-2z)$ is equal to

~~(a)~~ $4i$

27) Let $i=\sqrt{-1}$. If $\dfrac{\sqrt{-2}\sqrt{-8}-i^{23}}{\sqrt[3]{-8}+i}=A+Bi$, then $A+B=$

A) $\frac{11}{5}$

B) -2

C) $\frac{13}{5}$

D) 1

E) $\frac{7}{5}$