Number Systems
Conventional Questions

[19-20]

1. [S.4 19-20 Standardized test 1, #4]

(a) Simplify $\frac{26}{2+3i}$ and express the answer in the form of $a+bi$, where a and b are real numbers. **(2 marks)**

(b) If $\frac{26}{2+3i}+(c+ci)(-5+ci)$ is a real number, where c is a real constant, find the value(s) of c. **(2 marks)**

2. [S.4 19-20 Mid-year, #6]

It is given that $z=2i(7+ki)+4$, where k is a real number. If z is purely imaginary, find the value of k.
(2 marks)

3. [S.4 19-20 Mid-year, #8]

The sum of the squares of 3 consecutive positive integers is 302. Find the largest integer. **(3 marks)**

4. [S.4 19-20 Mid-year, #12]

(a) Express $\frac{1}{2-5i}$ in the form of $a+bi$. **(2 marks)**

(b) If $\frac{29}{2-5i}$ is a root of the quadratic equation $mx^2+px+q=0$, where p and q are real numbers, find the values of the p and q. **(2 marks)**

[21-22]

5. [S.4 21-22 Mid-year. #12]

Let $z=\frac{1}{4-3i}$.

(a) Express z in the form of $a+bi$, where a and b are real numbers. **(2 marks)**

(b) If $kz-2+hi=0$, where h and k are real numbers, find the value of h. **(3 marks)**

[22-23]

6. [S.4 22-23 Mid-Year,#10]

Express $\frac{2+i}{3-5i}$ in the form $a+bi$, where a and b are real numbers. **(2 marks)**

[23-24]

7. [S.4 23-24 Mid-Year,#11]

The real part of $\frac{k}{7-i}$ is 14, where k is real number. Find the value of k. **(3 marks)**

8. [S.4 23-24 Mid-Year,#12]

It is given that $(a+6i)(3-2i)=27+2bi$, where a and b are real numbers. Find the values of a and b.

(4 marks)

~End~

Ch.1 Number Systems
Multiple Choice Question

[19-20]

1. [19-20 Standardized test 1, #4]

Simplify $(\sqrt{3}+i)(\sqrt{27}-3i)$.

A. 6
B. 12
C. $6+6\sqrt{3}i$
D. $12+6\sqrt{3}i$

2. [19-20 Standardized test 1, #6]

$i^{2019}-i^{11}-i^{5}=$

A. $-i$.
B. i.
C. -1.
D. $-3i$.

3. [19-20 Mid-year, #4]

$-(i^{7})^{5}=$

A. i. **B.** $-i$.
C. 1. **D.** -1.

4. [19-20 Mid-year, #5]

It is given that $xi(5+2i)=-y+15i$, where x and y are real numbers. Find the values of x and y.

A. $x=3, y=6$
B. $x=3, y=-6$
C. $x=-3, y=6$
D. $x=-3, y=-6$

5. [19-20 Mid-year, #10]

Which of the following are true?

I. The sum of two irrational numbers may be a rational number.

II. The product of a rational number and an irrational number may be a rational number.

III. $2.0\dot{1}\dot{9}$ is a rational number.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[20-21]

6. [20-21 Mid-year, #11]

Find the real part of $\frac{p+3i}{p-3i}$ if p is a real number.

A. $\frac{p^2+9}{p^2-9}$

B. $\frac{p^2-9}{p^2+9}$

C. $\frac{6p}{p^2-9}$

D. $\frac{6p}{p^2+9}$

7. [20-21 Final Exam, #20]

Let $z=(2+3i)(k+i)$, where k is a real number. If z is purely imaginary, then $k=$

A. -1.

B. $-\frac{2}{3}$.

C. 1.

D. $\frac{3}{2}$.

8. [20-21 Final Exam, #21]

The imaginary part of $3i+6i^2+9i^3+12i^4$ is

A. –9.
B. –6.
C. 3.
D. 12.

9. [20-21 S.5 Final Exam, #33]

If k is a real number, then the real part of $\frac{2-i^6}{k-i}$ is

A. $\frac{-k}{k^2+1}$.

B. $\frac{1}{k^2+1}$.

C. $\frac{k}{k^2+1}$.

D. $\frac{3k}{k^2+1}$.

[21-22]

10. [21-22 Mid-year, #19]

If p is a real number, then the imaginary part of $\frac{5pi+i^{22}}{3p-i^{21}}$ is

A. $\frac{5}{3}$.

B. $\frac{-8p}{9p^2+1}$.

C. $\frac{15p^2-1}{9p^2-1}$.

D. $\frac{15p^2-1}{9p^2+1}$.

11. [21-22 Mid-year, #20]

Let β be a real number. Define $u = w + \frac{2}{w}$ and $v = w - \frac{2}{w}$, where $w = 1 - \beta i$. Which of the following must be true?

I. The real part of $u + v$ is 2.
II. The real part of u and the real part of v are the same.
III. uv is a rational number.

A. I only
B. II only
C. I and III only
D. II and III only

12. [21-22 Final exam, #15]

If k and $\frac{10}{3-i} + ki - i^2$ are real numbers, then $k =$

A. -1.
B. 0.
C. 1.
D. 4.

13. [21-22 S.5 Mid-year, #26]

Define $z_1 = \frac{3-ki}{1+i}$ and $z_2 = \frac{5(k+7i)}{2-i}$, where k is a real number. If z_1 is a purely imaginary number, then the real part of z_2 is

A. -13.
B. -1.
C. 11.
D. 17.

14. [21-22 S.5 Final Exam, #21]

If a is a real number, then the real part of $\frac{6i^{13} - 5ai^{10}}{2-i}$ is

A. $\frac{10a+6}{3}$.
B. $\frac{10a-6}{5}$.
C. $\frac{5a+12}{3}$.
D. $\frac{5a+12}{5}$.

15. [21-22 S.6 Mock, #35]

If k and $\frac{i^{456}}{1-i^{2021}} + ki$ are real numbers, then k =

A. -1.
B. $-\frac{1}{2}$.
C. $\frac{1}{2}$.
D. 1.

[22-23]

16. [S.4 22-23 Mid-Year,#7]

Let a be a real number. Which of the following are real numbers?

I. $-\sqrt{a^2}$
II. $\sqrt{-a^2}$
III. $-\sqrt{(-a)^2}$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

17. [S.4 22-23 Mid-Year,#15]

If a and $(2+3i)(-1-ai)+6i$ are real numbers, then a =

A. $\frac{3}{2}$.
B. $\frac{2}{3}$.
C. $-\frac{2}{3}$.
D. $-\frac{3}{2}$.

18. [S.4 22-23 Mid-Year,#16]

$i^{23}(7-ki)=$

A. $k+7i$.
B. $k-7i$.
C. $-k+7i$.
D. $-k-7i$.

19. [S.5 22-23 mid-year,#25]

If a is a real number, then the real part of $\frac{6+i^7}{a-i}+i^2$ is

A. $\frac{6a-a^2}{a^2+1}$.
B. $\frac{6-a}{a^2+1}$.
C. $\frac{6a-a^2}{a^2-1}$.
D. $\frac{6-a}{a^2-1}$.

20. [S.5 22-23 Final,#33]

Let $z=9i+8i^2+7i^3+6i^4+ki^5$, where k is a real number. If the real part and the imaginary part of z are equal, then the imaginary part of z is

A. –4.
B. –2.
C. 0.
D. 2.

21. [S.6 22-23 Timed Practice 2,#34]

If u is a real number, then the imaginary part of $\frac{3+i^7}{u-4i^5}+i^4$ is

A. $\frac{u^2+3u+20}{u^2+16}$.
B. $\frac{u^2+3u+20}{u^2-16}$.
C. $\frac{12-u}{u^2+16}$.
D. $\frac{12-u}{u^2-16}$.

22. [S.6 22-23 Timed Practice 4,#34]

If k is a real number, then the imaginary part of $-\frac{2+8ki}{2i}-i(3k+i)$ is

A. $-3k$. **B.** $3k-1$.

C. $1-4k$. **D.** $1-3k$.

23. [S.6 22-23 Timed Practice 5,#38]

If k is a real number, then the imaginary part of $\frac{(3+i)(1-2i)}{1+ki}$ is

A. $-\frac{5+5k}{1+k^2}$.

B. $\frac{5+5k}{1+k^2}$.

C. $\frac{5-5k}{1+k^2}$.

D. $\frac{5k-5}{1+k^2}$.

24. [S.6 22-23 Timed Practice 6,#34]

If k is a real number, then the real part of $\frac{6-i^5}{2i^4+ki^3}$ is

A. $\frac{-2\pm\sqrt{6k}}{4-k^2}$.

B. $\frac{12\pm k}{4-k^2}$.

C. $\frac{-2\pm 6k}{4+k^2}$.

D. $\frac{12\pm k}{4+k^2}$.

25. [22-23 S6 Mock,#35]

If k is a real number, then the imaginary part of $\frac{i^{28}+i^{23}}{k-i}+i^{17}$ is

A. $\frac{k^2-k+2}{k^2+1}$.

B. $\frac{k+1}{k^2+1}$.

C. $\frac{-k(k+1)}{k^2+1}$.

D. $\frac{k+1}{k-1}$.

[23-24]

26. [S.4 23-24 Mid-Year,#14]

The imaginary part of $3i^{13}+4i^{16}+5i^{19}-6i^{22}$ is

A. -9.
B. -2.
C. 8.
D. 10.

27. [S.4 23-24 Mid-Year,#20]

If $g=\frac{4}{1-ki}$ and $h=\frac{4}{1+ki}$, where k is a real number, which of the followings must be true?

I. gh is a real number.
II. The real part of g is equal to the real part of h.
III. $\frac{1}{g}-\frac{1}{h}$ is a purely imaginary number.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

28. [S.4 23-24 Final,#20]

$\frac{i^{2023}+2i^{2024}}{3+i}=$

A. $\frac{1}{2}-\frac{1}{2}i$.
B. $-\frac{1}{2}+\frac{1}{2}i$.
C. $-\frac{7}{10}-\frac{1}{10}i$.
D. $\frac{7}{10}+\frac{1}{10}i$.

28. [S.5 23-24 Mid-year,#25]

If k is a real number, then the real part of $\frac{k^2}{k+i^3}+\frac{1}{k-i^3}$ is

A. $\frac{k-1}{k+1}$.

B. k^2-1.

C. k^2+1.

D. k.

29. [S.5 23-24 Final,#34]

Let $z=6-ai^{11}+4ai^{14}+32i^{16}+8i^{17}$, where a is a real number. If the real part and the imaginary part are equal, then the imaginary part of z is

A. 8.

B. 10.

C. 14.

D. 18.

30. [S.6 23-24 Timed Practice 2,#28]

Let $u=\frac{5}{x-2i}$ and $v=\frac{5}{x+2i}$, where x is a real number. Which of the following must be true?

I. $u+v$ is a rational number.

II. Real part of u is equal to real part of v.

III. $\frac{1}{u}+\frac{1}{v}$ is a real number.

A. I only

B. II only

C. I and III only

D. II and III only

31. [S.6 23-24 Timed Practice 4,#27]

Let x be a real number. $\frac{3x-i}{i}-(2-xi)=$

A. $-3-2xi$.

B. $-1-4xi$.

C. $(3x-3)-xi$.

D. $(3x-3)+xi$.

32. [S.6 23-24 Timed Practice 6,#35]

The real part of $1+2i+(2i)^2+(2i)^3+\ldots+(2i)^{67}$ is

A. $\frac{1+2^{68}}{5}$.

B. $\frac{1-2^{68}}{5}$.

C. $1+2^{68}$.

D. $1-2^{68}$.

~End~