N.CN.A.2: Imaginary Numbers

1 Mrs. Donahue made up a game to help her class learn about imaginary numbers. The winner will be the student whose expression is equivalent to $-i$. Which expression will win the game?
1) i^{46} 2) i^{47} 3) i^{48} 4) i^{49}

2 What is the greatest possible integral value of x for which $\sqrt{x-5}$ is an imaginary number?
1) 5 2) 6 3) 3 4) 4

3 For any power of i, the imaginary unit, where b is a whole number, i^{4b+3} equals
1) 1 2) i 3) -1 4) $-i$

4 The expression i^{10} is equivalent to
1) 1 2) i 3) -1 4) $-i$

5 The value of i^{16} is
1) 1 2) -1 3) i 4) $-i$

6 The expression i^{25} is equivalent to
1) 1 2) -1 3) i 4) $-i$

7 Which expression is equivalent to i^{37}
1) 1 2) -1 3) i 4) $-i$

8 Which expression is equivalent to i^{55}?
1) 1 2) -1 3) i 4) $-i$

9 When simplified, i^{99} is equivalent to
1) 1 2) -1 3) i 4) $-i$

10 Which expression is equivalent to i^{233}
1) 1 2) -1 3) i 4) $-i$

11 The product of i^7 and i^5 is equivalent to
1) 1 2) -1 3) i 4) $-i$

12 The product $i^3 \cdot i^7$ is
1) 1 2) -1 3) i 4) $-i$

13 The expression $i^0 \cdot i^1 \cdot i^2 \cdot i^3 \cdot i^4$ is equal to
1) 1 2) -1 3) i 4) $-i$

14 What is the value of $(5i^3)^3$?
1) $-125i$ 2) $125i$ 3) $-15i$ 4) $15i$

15 If $f(x) = x^2$, what is the value of $f(2i)$?
1) -2 2) 2 3) -4 4) 4

16 If $f(x) = x^2$, what is the value of $f(i^3)$?
1) 1 2) -1 3) i 4) $-i$

17 When simplified, $i^{27} + i^{34}$ is equal to
1) i 2) i^{61} 3) $-i - 1$ 4) $i - 1$

18 The expression $i^{100} + i^{101} + i^{102}$ equals
1) 1 2) -1 3) $-i$ 4) i

19 If i is the imaginary unit, the expression $i^8 + i^9 + i^{10} + i^{11}$ is equivalent to
1) 1 2) -1 3) i 4) 0

20 The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$ 2) $2 - 3i$ 3) $-2 + 3i$ 4) $2 + 3i$

21 What is the value of $i^{99} - i^3$?
1) 1 2) i^{96} 3) $-i$ 4) 0

22 Expressed in simplest form, $i^{16} + i^6 - 2i^5 + i^{13}$ is equivalent to
1) 1 2) -1 3) i 4) $-i$

23 If $f(x) = x^3 - 2x^2$, then $f(i)$ is equivalent to
1) $-2 + i$ 2) $-2 - i$ 3) $2 + i$ 4) $2 - i$

24 The expression $i^2(2 - i)$ is equivalent to
1) $-2 - i$ 2) $-2 + i$ 3) $2 - i$ 4) $2 + i$

25 The expression $3i(2i^2 - 5i)$ is equivalent to
1) $15 - 6i$ 2) $15 - 5i$ 3) $-15 - 5i$ 4) $-1 + 0i$

26 The expression $x(3i^2)^3 + 2xi^{12}$ is equivalent to
1) $2x + 27xi$ 2) $-7x$ 3) $-25x$ 4) $-29x$

27 Express $4xi + 5yi^8 + 6xi^3 + 2yi^4$ in simplest $a + bi$ form.

28 Express $xi^8 - yi^6$ in simplest form.

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Answer Section

1 ANS: 2 REF: 060615b
2 ANS: 4 REF: 080021siii
3 ANS: 4 REF: 061615a2
4 ANS: 3 REF: 069527siii
5 ANS: 1 REF: 018631siii
6 ANS: 3 REF: 010705b
7 ANS: 3 REF: 080327siii
8 ANS: 4 REF: 010905b
9 ANS: 4 REF: 089830siii
10 ANS: 3 REF: 010334siii
11 ANS: 1 REF: 061019a2
12 ANS: 2 REF: 088423siii
13 ANS: 2
$i^0 \cdot i^1 \cdot i^2 \cdot i^3 \cdot i^4 = i^{10} = i^2 = -1.$

REF: 060410b
14 ANS: 2 REF: 060224siii
15 ANS: 3 REF: 080128siii
16 ANS: 2 REF: 010034siii
17 ANS: 3 REF: 080407b
18 ANS: 4
$i^{100} + i^{101} + i^{102}$

$i^0 + i^1 + i^2$

$1 + i + (-1)$

i

REF: 060819b
19 ANS: 4 REF: 060331siii
20 ANS: 1
$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

REF: 081004a2
21 ANS: 4
$i^{99} - i^3$

$i^3 - i^3$

0

REF: 060315b

22 ANS: 4

$i^{16} + i^6 - 2i^5 + i^{13}$

$1 + i^2 - 2i + i$

$1 + (-1) - i$

$-i$

REF: 080215b

23 ANS: 4

$f(i) = i^3 - 2i^2$

$-i - 2(-1)$

$2 - i$

REF: 010415b

24 ANS: 2 REF: 069925siii

25 ANS: 1

$3i(2i^2 - 5i) = 6i^3 - 15i^2 = 6(-i) - 15(-1) = 15 - 6i$

REF: 080702b

26 ANS: 3

$x(27i^6) + x(2i^{12}) = -27x + 2x = -25x$

REF: 011620a2

27 ANS:

$4xi + 5yi^8 + 6xi^3 + 2yi^4 = 4xi + 5y - 6xi + 2y = 7y - 2xi$

REF: 011433a2

28 ANS:

$xi^8 - yi^6 = x(1) - y(-1) = x + y$

REF: 061533a2