N.CN.A.2: Imaginary Numbers 1

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 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) $-i$

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

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

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

6 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) $-i$

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

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

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

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

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

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

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

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

15 Given i is the imaginary unit and $a = i^3$, $b = i^2$, and $c = i$, which expression is equivalent to $2ax^2 + 3bx - cx$?
1) $-2ix^2 - 3x + ix$ 2) $-2ix^2 - 3ix$
3) $-2ix^2 - 3x - ix$ 4) $-8ix^3 - 3x - ix$

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

17 Express $8xi^{10} - 4yi^{19} + 2yi^3 - 6xi$ in simplest form, where i is the imaginary unit.

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

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Answer Section

1 ANS: 2 REF: 060615b
2 ANS: 4 REF: 061615a2
3 ANS: 3 REF: 010705b
4 ANS: 4 REF: 010905b
5 ANS: 1 REF: 061019a2
6 ANS: 2

$i^0 \cdot i^1 \cdot i^2 \cdot i^3 \cdot i^4 = i^{10} = i^2 = -1.$

REF: 060410b
7 ANS: 3 REF: 080407b
8 ANS: 4

$i^{100} + i^{101} + i^{102}$

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

$1 + i + (-1)$

i

REF: 060819b
9 ANS: 1

$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

REF: 081004a2
10 ANS: 4

$i^{99} - i^3$

$i^3 - i^3$

0

REF: 060315b
11 ANS: 4

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

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

$1 + (-1) - i$

$-i$

REF: 080215b
12 ANS: 4

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

$-i - 2(-1)$

$2 - i$

REF: 010415b

13 ANS: 1

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

REF: 080702b

14 ANS: 3

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

REF: 011620a2

15 ANS: 3

$2(i^3)x^2 + 3(i^2)x - ix$

$2(-i)x^2 + 3(-1)x - ix$

$-2ix^2 - 3x - ix$

REF: 062506aii

16 ANS:

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

REF: 061533a2

17 ANS:

$8xi^{10} - 4yi^{19} + 2yi^3 - 6xi = 8x(-1) - 4y(-i) + 2y(-i) - 6xi = -8x + 4yi - 2yi - 6xi = -8x + 2yi - 6xi$

REF: 082527aii

18 ANS:

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

REF: 011433a2