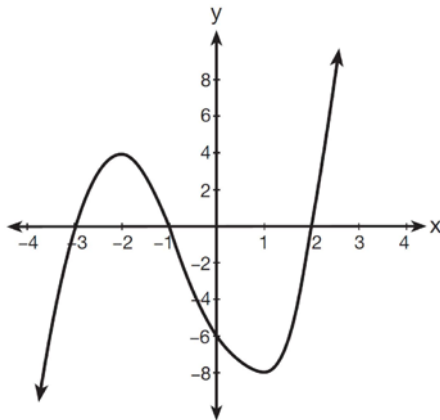


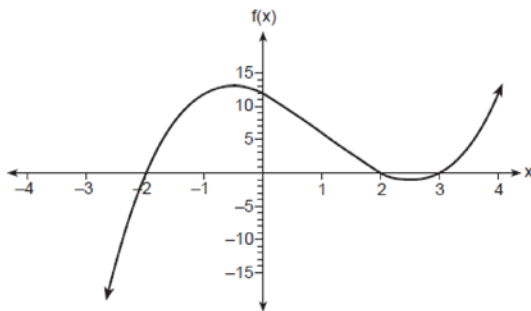
F.IF.B.4: Graphing Polynomial Functions

- 1 What are the zeros of the polynomial function graphed below?



- 1) $\{-3, -1, 2\}$
- 2) $\{3, 1, -2\}$
- 3) $\{4, -8\}$
- 4) $\{-6\}$

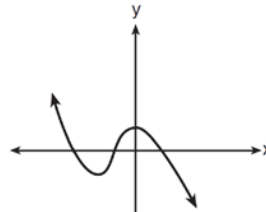
- 2 The function $f(x)$ is graphed on the set of axes below.



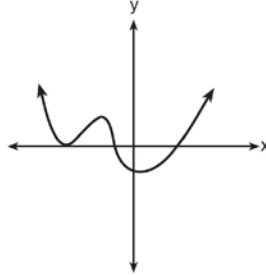
State the zeros of $f(x)$. Explain your reasoning.

- 3 Which graph has the following characteristics?

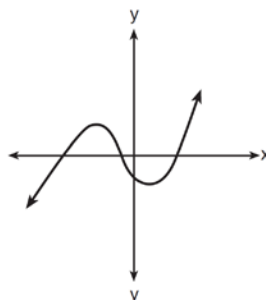
- three real zeros
- as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
- as $x \rightarrow \infty$, $f(x) \rightarrow \infty$



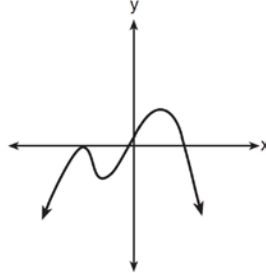
1)



2)

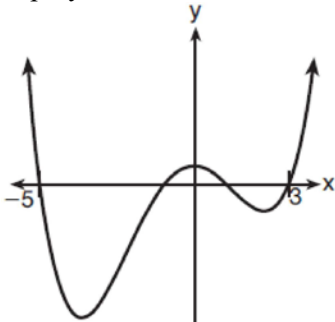


3)

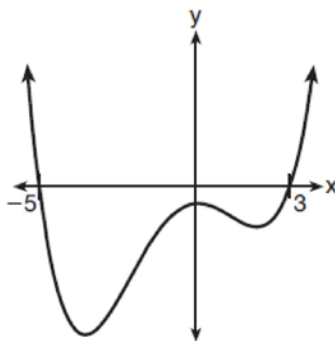


4)

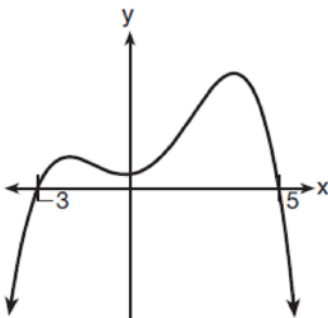
- 4 A 4th degree polynomial has zeros -5 , 3 , i , and $-i$. Which graph could represent the function defined by this polynomial?



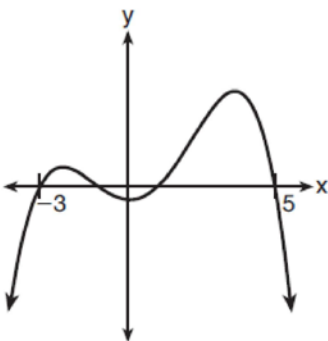
1)



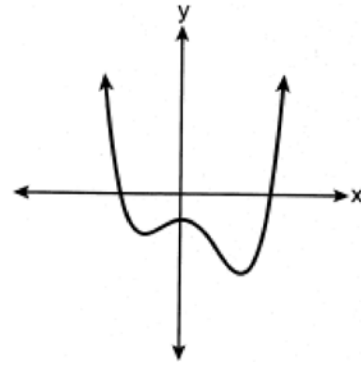
2)



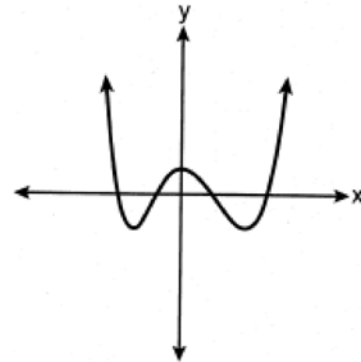
3)



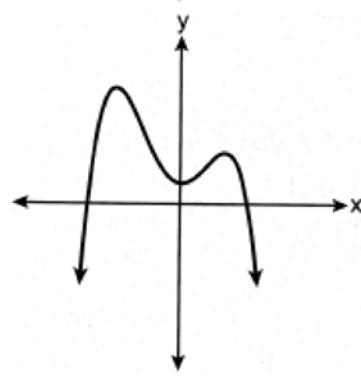
4)



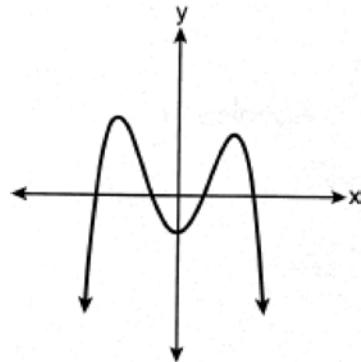
1)



2)



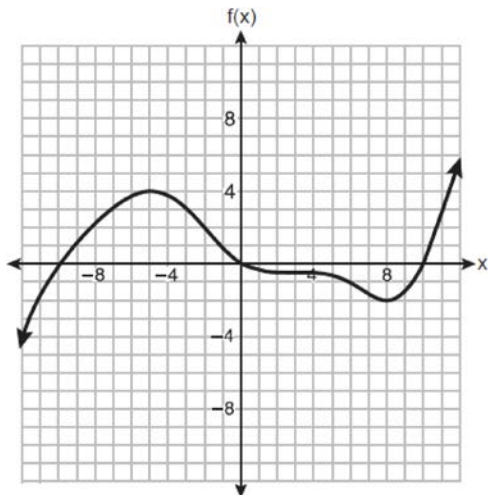
3)



4)

- 5 Which graph could represent a 4th degree polynomial function with a positive leading coefficient, 2 real zeros, and 2 imaginary zeros?

- 6 The graph of the function $f(x)$ is shown below.



In which interval is $f(x)$ always positive?

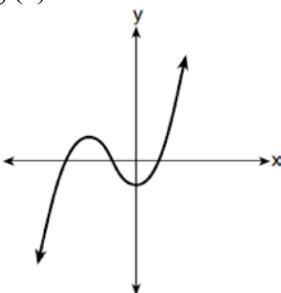
- 1) $(-2, 4)$
- 2) $(0, 10)$
- 3) $(-12, -5)$
- 4) $(-10, 0)$

- 7 Consider the end behavior description below.

- as $x \rightarrow -\infty, f(x) \rightarrow \infty$
- as $x \rightarrow \infty, f(x) \rightarrow -\infty$

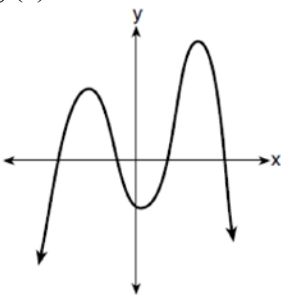
Which function satisfies the given conditions?

- 1) $f(x) = x^4 + 2x^2 + 1$



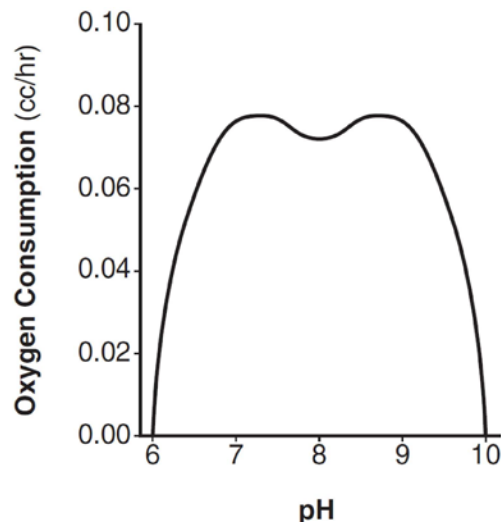
2)

- 3) $f(x) = -x^3 + 2x - 6$



4)

- 8 There was a study done on oxygen consumption of snails as a function of pH, and the result was a degree 4 polynomial function whose graph is shown below.



Which statement about this function is *incorrect*?

- 1) The degree of the polynomial is even.
- 2) There is a positive leading coefficient.
- 3) At two pH values, there is a relative maximum value.
- 4) There are two intervals where the function is decreasing.

- 9 The average cost of a gallon of milk in the United States between the years of 1995 and 2018 can be modeled by the equation

$$P(t) = -0.0004t^3 + 0.0114t^2 - 0.0150t + 2.6602,$$

where $P(t)$ represents the cost, in dollars, and t is time in years since January 1995. During this time period, in what year did $P(t)$ reach its maximum?

- 1) 1995
- 2) 2013
- 3) 2014
- 4) 2018

- 10 Consider a cubic polynomial with the characteristics below.
- exactly one real root
 - as $x \rightarrow \infty, f(x) \rightarrow -\infty$
- Given $a > 0$ and $b > 0$, which equation represents a cubic polynomial with these characteristics?
- 1) $f(x) = (x - a)(x^2 + b)$
 - 2) $f(x) = (a - x)(x^2 + b)$
 - 3) $f(x) = (a - x^2)(x^2 + b)$
 - 4) $f(x) = (x - a)(b - x^2)$
- 11 Which description could represent the graph of $f(x) = 4x^2(x + a) - x - a$, if a is an integer?
- 1) As $x \rightarrow -\infty, f(x) \rightarrow \infty$, as $x \rightarrow \infty, f(x) \rightarrow \infty$, and the graph has 3 x -intercepts.
 - 2) As $x \rightarrow -\infty, f(x) \rightarrow -\infty$, as $x \rightarrow \infty, f(x) \rightarrow \infty$, and the graph has 3 x -intercepts.
 - 3) As $x \rightarrow -\infty, f(x) \rightarrow \infty$, as $x \rightarrow \infty, f(x) \rightarrow -\infty$, and the graph has 4 x -intercepts.
 - 4) As $x \rightarrow -\infty, f(x) \rightarrow -\infty$, as $x \rightarrow \infty, f(x) \rightarrow \infty$, and the graph has 4 x -intercepts.
- 12 Given $f(x) = x^4 - x^3 - 6x^2$, for what values of x will $f(x) > 0$?
- 1) $x < -2$, only
 - 2) $x < -2$ or $x > 3$
 - 3) $x < -2$ or $0 \leq x \leq 3$
 - 4) $x > 3$, only
- 13 An estimate of the number of milligrams of a medication in the bloodstream t hours after 400 mg has been taken can be modeled by the function below.
- $$I(t) = 0.5t^4 + 3.45t^3 - 96.65t^2 + 347.7t, \text{ where } 0 \leq t \leq 6$$
- Over what time interval does the amount of medication in the bloodstream strictly increase?
- 1) 0 to 2 hours
 - 2) 0 to 3 hours
 - 3) 2 to 6 hours
 - 4) 3 to 6 hours
- 14 The function below models the average price of gas in a small town since January 1st.
- $$G(t) = -0.0049t^4 + 0.0923t^3 - 0.56t^2 + 1.166t + 3.23,$$
- where $0 \leq t \leq 10$.
- If $G(t)$ is the average price of gas in dollars and t represents the number of months since January 1st, the absolute maximum $G(t)$ reaches over the given domain is about
- 1) \$1.60
 - 2) \$3.92
 - 3) \$4.01
 - 4) \$7.73
- 15 A polynomial equation of degree three, $p(x)$, is used to model the volume of a rectangular box. The graph of $p(x)$ has x intercepts at -2 , 10 , and 14 . Which statements regarding $p(x)$ could be true?
- A. The equation of $p(x) = (x - 2)(x + 10)(x + 14)$.
 - B. The equation of $p(x) = -(x + 2)(x - 10)(x - 14)$.
 - C. The maximum volume occurs when $x = 10$.
 - D. The maximum volume of the box is approximately 56.
- 1) A and C
 - 2) A and D
 - 3) B and C
 - 4) B and D
- 16 Factor completely over the set of integers:
- $$16x^4 - 81.$$
- Sara graphed the polynomial $y = 16x^4 - 81$ and stated “All the roots of $y = 16x^4 - 81$ are real.” Is Sara correct? Explain your reasoning.

F.IF.B.4: Graphing Polynomial Functions

Answer Section

1 ANS: 1 REF: 081501a2

2 ANS:
 $\pm 2, 3$ are the x -intercepts of f .

REF: 062326ai

3 ANS: 3
 The graph shows three real zeros, and has end behavior matching the given end behavior.

REF: 061604aii

4 ANS: 2 REF: 061816aii

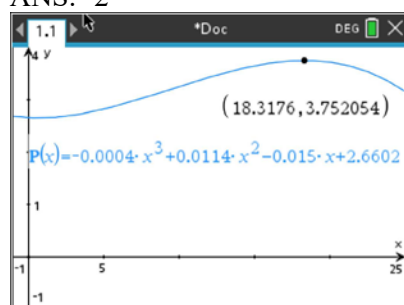
5 ANS: 1 REF: 082414aii

6 ANS: 4 REF: 082318aii

7 ANS: 3 REF: 012005aii

8 ANS: 2 REF: 061620aii

9 ANS: 2



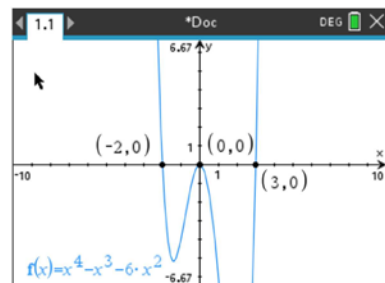
REF: 012414aii

10 ANS: 2
 1) $x \rightarrow \infty, f(x) \rightarrow \infty$; 3) quartic polynomial; 4) three real roots

REF: 012318aii

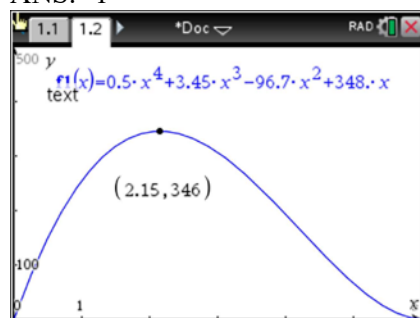
11 ANS: 2 REF: 081908aii

12 ANS: 2



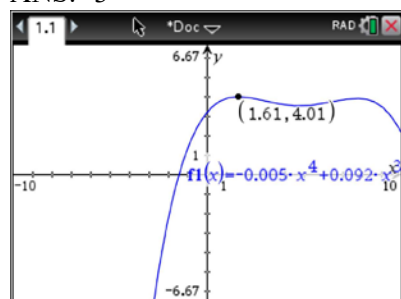
REF: 012316aii

13 ANS: 1



REF: 011908aaii

14 ANS: 3



REF: 011817aaii

15 ANS: 4

The maximum volume of $p(x) = -(x+2)(x-10)(x-14)$ is about 56, at $x = 12.1$

REF: 081712aaii

16 ANS:

$16x^4 - 81 = (4x^2 + 9)(4x^2 - 9) = (4x^2 + 9)(2x + 3)(2x - 3)$. No, because $\pm \frac{3i}{2}$ are roots.

REF: 061933aaii