Polynomial Functions

1. Write an expression that is equivalent to , combining all like terms.
2. Which expression is equivalent to ?  
     
   A.   
   B.   
   C.   
   D.
3. Write an expression equivalent to ) in the form A*xmyn*.
4. Multiply and combine like terms to determine the product of these polynomials.
5. Which expression is equivalent to ?  
     
   A.   
   B.   
   C.   
   D.
6. Which expression is equivalent to ?  
     
   A.   
   B.   
   C.   
   D.
7. Find all the zeros of the following polynomial function and enter them into the boxes.

|  |  |  |  |
| --- | --- | --- | --- |

1. Kiera claims that the sum of two linear polynomials with rational coefficients is always a   
   linear polynomial with rational coefficients.  
     
   Use the numbers 1 (first) through 6 (last) to place the statements into a logical sequence to outline an argument that supports Kiera’s claim.

| **Statement** | **Order (1 is first, 6 is last)** |
| --- | --- |
|  |  |
|  |  |
| Given and where *a*, *b*, *c*, and *d* are rational numbers. |  |
| and are rational numbers |  |
| So is a linear polynomial with rational coefficients. |  |
|  |  |

1. *P*(*x*) is a 4th degree polynomial. The graph of has exactly three distinct *x*-intercepts.  
     
   **Part A**  
   Which polynomial could be *P*(*x*)?  
     
   A.   
   B.   
   C.   
   D.   
     
   **Part B**For **one** of the polynomials above, explain why it could **not** be *P*(*x*).
2. **Proposition 1** The sum of two linear polynomials with integer coefficients is always a   
   linear polynomial with integer coefficients.  
     
   The outline of a proof of Proposition 1 is shown. Add one or more justifications for steps 3, 4, and 5 of the proof from the list of justifications below.

**The Closure of the Integers Under Addition** The sum of two integers is always an integer

**The Commutative Property** If A and B are real numbers, then A + B = B + A

**The Associative Property** If A, B, and C are real numbers, then (A + B) + C = A + (B + C)

**The Distributive Property** If A, B, and C are real numbers, then A(B + C) = AB + AC

**The Any-Order Property of Addition** The sum of two or more real numbers can be performed in any order or any grouping.

| **Statement** | **Justification** |
| --- | --- |
| Given and where *a*, *b*, *c*, and *d* are integers. | Hypothesis |
|  | By Definition |
|  |  |
|  |  |
| and are integers |  |
| So is a linear polynomial with integer coefficients. | Conclusion |

**Teacher Material**

A-SSE.A

Interpret the structure of expressions.

A-APR.A

Perform arithmetic operations on polynomials.

F-IF.A

Understand the concept of a function and use function notation.

F-IF.C

Analyze functions using different representations.

F-BF.A

Build a function that models a relationship between two quantities.

| **Question** | **Claim** | **Key/Suggested Rubric** |
| --- | --- | --- |
| 1[[1]](#footnote-1) | 1 | **1 point:** , or equivalent expression with 3 terms. |
| 21 | 1 | **1 point:** Selects C. |
| 31 | 1 | **1 point:** Writes . |
| 41 | 1 | **1 point:** Writes, , or equivalent expression with 5 terms. |
| 51 | 1 | **1 point:** Selects D. |
| 61 | 1 | **1 point:** Selects B. |
| 7[[2]](#footnote-2) | 2 | **1 point:** *x* = –4, *x* = 6, *x* = –2, and *x* = 2 (in any order). NOTE: Allow students to just write the values of *x* (–4, 6, –2, and 2) in the boxes. |
| 8[[3]](#footnote-3) | 3 | **1 point:**   | **Statement** | **Order (1 is first, 6 is last)** | | --- | --- | |  | 3 | |  | 2 | | Given and where *a*, *b*, *c*, and *d* are rational numbers. | 1 | | and are rational numbers | 5 | | So is a linear polynomial with rational coefficients. | 6 | |  | 4 | |
| 93 | 3 | **2 points:** Selects B AND Explains why A, C, or D could not be *P*(*x*). **Example 1:** A could not be *P*(*x*) because its graph only has two distinct *x*-intercepts at 0 and 3. **Example 2:** C could not be *P*(*x*) because it’s only a 3rd degree polynomial. **Example 3:** D could not be *P*(*x*) because its graph has 4 distinct *x*-intercepts at 0, 3, 2, and 1.  **1 point:** Selects B OR Explains why A, C, or D could not be *P*(*x*). |
| 103 | 3 | **1 point:**   | **Statement** | **Justification** | | --- | --- | | Given and where *a*, *b*, *c*, and *d* are integers. | Hypothesis | |  | By Definition | |  | **The Any-Order Property of Addition** OR  **The Commutative Property** | |  | **The Distributive Property** | | and are integers | **The Closure of the Integers Under Addition** | | So is a linear polynomial with integer coefficients. | Conclusion | |

1. From Smarterbalanced.org. Grade 11, Claim 1, Target F Item Specifications. Internet. Available from <http://www.smarterbalanced.org/smarter-balanced-assessments/>; accessed 11/2015. [↑](#footnote-ref-1)
2. From Smarterbalanced.org. Grade 11, Claim 2 Item Specifications. Internet. Available from <http://www.smarterbalanced.org/smarter-balanced-assessments/>; accessed 11/2015. [↑](#footnote-ref-2)
3. From Smarterbalanced.org. Grade 11, Claim 3 Item Specifications. Internet. Available from <http://www.smarterbalanced.org/smarter-balanced-assessments/>; accessed 11/2015. [↑](#footnote-ref-3)