Module 2.A: Algebra- Simplifying Expressions

Learning Objectives
1. Use the Properties of Real Numbers to simplify an algebraic expression.
2. Multiply polynomials.
3. Multiply special form polynomials.
4. Simplify a rational expression.
5. Factor a polynomial.
6. Factor one of the special form polynomials.

SECTION 1 - Use the Properties of Real Numbers to simplify an algebraic expression.

Properties of Real Numbers: Let a, b and c represent real numbers.
- Commutative: \( a + b = b + a \), and \( ab = ba \)
- Associative: \( a + (b + c) = (a + b) + c \), and \( a(bc) = (ab)c \)
- Distributive: \( a(b + c) = ab + ac \)
- Additive Identity is 0 since \( a + 0 = 0 + a = a \).
- Multiplicative Identity is 1 since \( a \cdot 1 = 1 \cdot a = a \).
- Additive Inverse of \( a \) is \( -a \) since \( 0 + (-a) = -a + a = 0 \).
- Multiplicative Inverse of \( a \) is \( \frac{1}{a} \) since \( a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = 1 \), when \( a \neq 0 \).

EXERCISE 1

Simplify a) \(-3x^2 - (x + 2x^2) - 3x\) b) \(-3xy^2 + 2x^2y - (4xy^2 + 5x^2y)\)

SOLUTION

a) \[-3x^2 -(x + 2x^2) - 3x = -3x^2 - x - 2x^2 - 3x = -3x^2 - 2x^2 - x - 3x = (-3 - 2)x^2 + (-1 - 3)x = -5x^2 - 4x\]
b) \[-3xy^2 + 2x^2y - (4xy^2 + 5x^2y) = -3xy^2 + 2x^2y - 4xy^2 - 5x^2y = -3xy^2 - 4xy^2 + 2x^2y - 5x^2y = (-3 - 4)xy^2 + (2 - 5)x^2y = -7xy^2 - 3x^2y\]
SECTION 2  Multiply polynomials.

EXERCISE 2

Multiply $3x(2x^2 - 6x + 1)$.

SOLUTION

$$3x(2x^2 - 6x + 1) = 6x^3 - 18x^2 + 3x$$

MODULE 2.A - ASSESSMENT

_____ 1. Simplify $5x^2 - 2(3x - 4x^2) - x$

A $13x^2 - 7x$  
B $x^2 - 7x$  
C $-3x^2 - 7x$  
D $3x^2 - x$  
E I do not know

_____ 2. Simplify $5xy^2 + 3x^2y + 2(-xy^2 + 3x^2y)$

A $9x^2y$  
B $7xy^2 + 9x^2y$  
C $7xy^2 + 6x^2y$  
D $3xy^2 + 9x^2y$  
E I do not know

_____ 3. Multiply $2x(7x^2 - 2x - 1)$

A $14x^2 - 4x - 2$  
B $14x^3 - 4x^2 - 2x$  
C $14x^3 - 2x - 1$  
D none of these  
E I do not know