Name: _____                          Date: _____

| **Learning Goal 3.1** | Perform combined operations with polynomials. |
|---|---|

*something that stays the same.*

**Recall** the process of multiplying a polynomial by a constant (*a term with no variable.*

**Example** Expand and simplify the following expressions, if possible.

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

$= 6x^2 - 9x + 6$

$-3(6a^7 - 9b^6 + 6c^5)$

$= -18a^7 + 27b^6 - 18c^5$

$5(3x^4 - 9x^2 + 2x^3 + 3x^2 - 5x^4)$

$= 5(-2x^4 - 6x^2 + 2x^3)$

$= 5(-2x^4 + 2x^3 - 6x^2)$

$= -10x^4 + 10x^3 - 30x^2$

$-5(4abc - 7ab^2c + 2abc^2 - 5a^2bc + 6a^2bc^2)$

$= -20abc + 35ab^2c - 10abc^2$

$+ 25a^2bc - 30a^2bc^2$

The same rules apply if that constant is replaced with a monomial (*one term polynomial*).

**Example** Expand and simplify the following expressions, if possible.

$2x(4x)$

$= 8x^2$

$2x(4x - 3)$

$= 8x^2 - 6x$

$2x(x^2 + 4x - 3)$

$2x(x^2 + 4x - 3y - x^2y + 4x - 3)$

$= 2x(x^2 + 8x - 3y - x^2y - 3)$

$= 2x^3 + 16x^2 - 6xy - 2x^3y - 6x$

$= 2x^3 + 8x^2 - 6xy - 2x^3y + 8x^2 - 6x$

$= 2x^3 + 16x^2 - 6xy - 2x^3y - 6x$

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The same rules apply if that constant is replaced with a binomial (_a polynomial with 2_ ).
                                                    terms

**Example** Expand and simplify the following expressions, if possible.

$(x + 1)(x + 2)$

$= x^2 + 2x + x + 2$

$= x^2 + 3x + 2$

$(x + 5)(x + 3)$

F    O    I    L

$= x^2 + 3x + 5x + 15$

$= x^2 + 8x + 15$

$(x + 1)(x - 2)$

$= x^2 - x - 2$

$(x - 5)(x - 3)$

$= x^2 - 8x + 15$

$(2x + 1)(4x + 3)$

$= 8x^2 + 10x + 3$

$(2x + 3)^2$  $= 4x^2 + 9$

$= (2x + 3)(2x + 3)$

$= 4x^2 + 6x + 6x + 9$

$= 4x^2 + 12x + 9$

$(x - 8)(x^2 + 4x - 3)$

$= x^3 + 4x^2 - 3x - 8x^2 - 32x + 24$

$= x^3 - 4x^2 - 35x + 24$

$(2xy + 3)(x^3 - x^2y + xy^2 - y^3)$

$= 2x^4y - 2x^3y^2 + 2x^2y^3 - 2xy^4$

$+ 3x^3 - 3x^2y + 3xy^2 - 3y^3$

**4.** Expand and simplify.

   **a)** $(g + 1)(g^2 + 2g + 3)$

   **b)** $(2 + t + t^2)(1 + 3t + t^2)$

   **c)** $(2w + 3)(w^2 + 4w + 7)$

   **d)** $(4 + 3n + n^2)(3 + 5n + n^2)$

a) $g^3 + 2g^2 + 3g + g^2 + 2g + 3$

$= g^3 + 3g^2 + 5g + 3$