# POLYNOMIALS

***ADDING AND SUBTRACTING***

***Example***: $(2x^2 - 3x + 4) + (2x^3 - x^2 + x - 8)$

$$(2x^2 - 3x + 4) + (2x^3 - x^2 + x - 8)$$
$$2x^2 - 3x + 4 + 2x^3 - x^2 + x - 8$$
$$2x^3 + x^2 - 2x - 4$$ *Combine like terms*

***Example***: $(xy^2 - xy + x^2y) - (3xy + 4x^2y - 5xy^2)$

$$(xy^2 - xy + x^2y) - (3xy + 4x^2y - 5xy^2)$$ *Distribute the negative*
$$xy^2 - xy + x^2y - 3xy - 4x^2y + 5xy^2$$
$$-3x^2y - 4xy + 6xy^2$$ *Combine like terms*

***EXERCISES:***

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

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

(3) $(4a^3 - a^2b + 6b - ab^2) - (3a^2b + ab^2 - b^3)$

***MULTIPLYING***

***Example***: Simplify.

a) $4x^2(5x^2 - x + 3)$
$= 20x^4 - 4x^3 + 12x^2$

b) $(2x + 3y)(5x - 4y)$
$= 10x^2 - 8xy + 15xy - 12y^2$
$= 10x^2 + 7xy - 12y^2$

c) $(3x - 2y)^2$
$= (3x - 2y)(3x - 2y)$
$= 9x^2 - 6xy - 6xy + 4y^2$
$= 9x^2 - 12xy + 4y^2$

d) $(x^2 - x + 3)(3x^2 + 4x - 9)$
$= 3x^4 + 4x^3 - 9x^2 - 3x^3 - 4x^2 + 9x + 9x^2 + 12x - 27$
$= 3x^4 + x^3 - 4x^2 + 21x - 27$

(4) $5x(3xy + 4y - 5x)$

(5) $(3x + 1)(2x - 6)$

(6) $(x - 3y)(6x - 7y)$

(7) $(x^2 + 3)(3x^2 + 10)$

(8) $(2x + 7)^2$

(9) $(5x - 3y)^2$

(10) $(6a^2 + 5b^2)^2$

(11) $(7r^2 - rs + 4s^2)(r^2 - 7rs + 12s^2)$

***PERFECT SQUARE TRINOMIALS***

$$(\boldsymbol{a+b})^{\boldsymbol{2}} = \boldsymbol{a^2 + 2ab + b^2}$$
$$(\boldsymbol{a-b})^{\boldsymbol{2}} = \boldsymbol{a^2 - 2ab + b^2}$$

***Examples***: Simplify.

a) $(2x+5)^2$

$= (2x)^2 + 2 \cdot 2x \cdot 5 + 5^2$

$= 4x^2 + 20x + 25$

b) $\left(\frac{1}{2}r - 4s^3\right)^2$

$= \left(\frac{1}{2}r\right)^2 - 2 \cdot \frac{1}{2}r \cdot 4s^3 + (4s^3)^2$

$= \frac{1}{4}r^2 - 4rs^3 + 16s^6$

***EXERCISES:***

(12) $(3x+1)^2$ (13) $(4c-3d)^2$ (14) $\left(\frac{1}{3}x + 2\right)^2$ (15) $(2x^2 - 4y^3)^2$

**Answers**

1.) $2x^2 + 3xy$
2.) $2x^2 + 7x + 2$

3.) $4a^3 - 4a^2b - 2ab^2 + 6b + b^3$
4.) $15x^2y + 20xy - 25x^2$
5.) $6x^2 - 16x - 6$
6.) $6x^2 - 25xy + 21y^2$
7.) $3x^4 + 19x^2 + 30$
8.) $4x^2 + 28x + 49$
9.) $25x^2 - 30xy + 9y^2$
10.) $36a^4 + 60a^2b^2 + 25b^4$
11.) $7r^4 - 50r^3s + 95r^2s^2 - 40rs^3 + 48s^4$
12.) $9x^2 + 6x + 1$
13.) $16c^2 - 24cd + 9d^2$
14.) $\frac{1}{9}x^2 + \frac{4}{3}x + 4$
15.) $4x^4 - 16x^2y^3 + 16y^6$