CHAPTER 1.2 B
WORKSHEET: OPERATIONS WITH MONOMIALS

1. Theory Summary – Definitions

- **Addition of Monomials:** When the monomials are **similar**, the sum of the monomials is a monomial **similar to them**, and its coefficient is equal to the sum of their coefficients

Examples: $2x^2y+4x^2y=6x^2y$, $2\alpha^3\beta^6-6\beta^6\alpha^3=-4\alpha^3\beta^6$.

When the monomials are **not similar**, their sum is an algebraic expression.

- **Product of Monomials:** The product of monomials is defined both between similar and non-similar monomials. The product of monomials is a monomial with:

  a) ***Coefficient*** equal to the product of the coefficients of the monomials.

  b) ***Principal part*** containing the variables of the monomials, each having as an exponent the sum of the exponents.

  Examples:

  $3x^4\cdot 2x^5\cdot(-4x^2)=-24x^{4+5+2}=-24x^{11}$, $-3\alpha^3\beta^2\cdot(-2\alpha\beta^3)=6\alpha^{3+1}\beta^{2+3}=6\alpha^4\beta^5$
- **Division of Monomials:** The quotient of monomials is defined both between similar and non-similar monomials. The quotient of monomials has:

  a) Coefficient equal to the quotient of the coefficients of the monomials.

  b) Principal part containing the variables of the monomials, each having as an exponent the difference of the exponents.

  Examples: $30x^5:2x^3=15x^{5-3}=15x^2$, $\dfrac{-8\alpha^3\beta^2}{(-2\alpha\beta^3)}=4\alpha^{3-1}\beta^{2-3}=4\alpha^2\beta^{-1}$

REMARKS:

- The product of monomials is **always a monomial**.
- The quotient of monomials **may not be a monomial.**

EXERCISES

TOPIC A: Theory & Understanding Questions

A1. Characterize the following statements as True (T) or False (F):

- **a)** The quotient of two opposite monomials is a real number.
- **b)** Division between two monomials is performed only if the monomials are similar.
- **c)** The sum of two monomials is always a monomial.
- **d)** The quotient of two similar monomials is a real number.
- **e)** The product of monomials is a monomial.

TOPIC B

B1. Perform the operations:

α) $2x^3y^2-3x^3y^2+6x^3y^2+3x^3y^2$

β) $\frac{1}{4}x^5y-\frac{1}{2}x^5y$

γ) $3\alpha^2\beta^4+(2\alpha\beta^2)^2$

δ) $\sqrt{8}x^2y^4-\sqrt{2}x^2y^4$

ε) $4x^2-\frac{2}{5}x^2+\frac{1}{2}x^2$

στ) $\frac{6}{5}x^3y-\frac{16}{10}x^3y+\frac{17}{5}x^3y$

B2. Perform the operations:

α) $-4x\cdot 6x^3$

β) $2xy^3(-2x^2)$

γ) $-2\alpha^3\beta(-4\alpha\beta)(-5\alpha\beta^2)$

δ) $(2x)^3\cdot 3x^2$

ε) $(\frac{-3}{5}xy^2)\cdot(\frac{25}{6}x^2y)$

στ) $(\frac{1}{3}xy)\cdot(6xy^3)\cdot(\frac{-1}{2}xy^2)$

B3. Perform the operations:

α) $3\alpha^5:4\alpha^4$

β) $\frac{4\alpha^5\beta^4}{3\alpha^2\beta^3}$

γ) $\frac{-x^2}{x^4}$

δ) $\frac{24x^3y^2}{(-2xy)^3}$

ε) $\frac{-27\alpha\beta^3(yx)^2}{(-3\alpha x\beta y)^2}$

στ) $\frac{x^2y^8}{x^5y^6}$

TOPIC C

Find μ,ν such that $-5x^{\mu}y^4+9x^8y^{2-\nu}$ is a monomial.