Station 1: Graphing Polynomials

For each polynomial:

- Write the polynomial in standard form
- Identify the leading coefficient and degree
- Determine the end behavior
- State the x and y intercepts
- Sketch a graph of the polynomial

1. $y = 2x^2 - x^3 - 3x + 4$

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

3. $y = 5x^3 - 4x^4 + 2x^2 + 1 + 3x$

Station 2: Adding, Subtracting, & Multiplying Polynomials

Perform the indicated operation and write your answer in standard form.

1. $(-4x^4 + 14 + 3x^2) + (-3x^4 - 14x^2 - 8)$

2. $(13x^2 - 6x^5 - 2x) - (-10x^2 - 11x^5 + 9x)$

3. $(4x + 2)(6x^2 - x + 2)$

4. $(6x^2 - 6x - 5)(7x^2 + 6x - 5)$

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

Station 3: Polynomial Identities

Apply polynomial identities to factor expressions.

1. $3x^3 - 24$

2. $x^6 + 27$

3. $2x^4 - 50$

Expand the binomial using the binomial theorem with Pascal's Triangle.

4. $(x - 3)^5$

Station 4: Dividing Polynomials

Divide the polynomial by the binomial using either long division or synthetic division. Write the quotient and the remainder (if any).

1. $(5x^3 + x^4 - 6x + 3) \div (x + 3)$

2. $(2x^2 - 17x - 38) \div (2x + 3)$

Evaluate each function using synthetic division.

3. $(5x^4 + 2x^2 - 15x + 10)$ at $x = -2$

4. $(2x^3 - 11x^2 + 9x - 20)$ at $x = 5$

Station 5: Zeros of Polynomial Functions

List all possible rational zeros for each function. Then find all rational zeros.

1. $f(x) = -10x^3 - 39x^2 - 45x - 25$

2. $f(x) = -15x^3 + 49x^2 - 55x + 25$

3. $f(x) = 2x^3 - 7x^2 - 20x - 11$

Station 6: Root Theorems about Polynomial Equations

Write a polynomial function of least degree with rational coefficients that has the given zeros.

1. $-1,\ 1+3\mathrm{i}$

2. $1-\mathrm{i},\ \sqrt{7}$

3. -3 multiplicity $2,\ 2\sqrt{2}$