5.2 Day 2 – Polynomials & Synthetic Division

Warm-Up: Find the quotient using long division.

$(x^4 + x^3 - 6x^2 - 4x + 14) \div (x^2 + x - 2)$

Synthetic division is an efficient way to divide a polynomial by a linear binomial using only coefficients.

To use synthetic division:

- The polynomial must be in standard form (exponents in descending order)
- Must include 0 for any skipped exponents
- Synthetic division only works when dividing by a linear binomial.

Let's compare long division and synthetic division. **Ex**: $(2y^3 - y^2 + 25) \div (y - 3)$

Long division:

$2y^2 + 5y + 15$

$y - 3 \,\overline{)\, 2y^3 - y^2 + 0y + 25}$

$-(2y^3 - 6y^2)$

$5y^2 + 0y$

$-(5y^2 - 15y)$

$15y + 25$

$-(15y - 45)$

$\boxed{70}$

synthetic division:

3| 2 -1 0 25

Use synthetic division to find each quotient.

Ex. $(x^3 - 7x^2 + 15x - 9) \div (x - 3)$

1. $(x^3 - 3x^2 - 5x - 25) \div (x - 5)$

2. $(g^3 - 4g^2 - 8g - 3) \div (g + 1)$

3. $(3x^3 + 17x^2 + 21x - 9) \div (x + 3)$

Watch out for missing terms!

Ex. $(y^3 + 4y^2 + 4y) \div (y + 2)$

4. $(2b^4 + 6b^3 + 5b^2 - 45) \div (b + 3)$

Practicing with remainders.

Ex. $(x^3 + 3x^2 - x + 2) \div (x - 1)$

5. $(9x^3 - 48x^2 + 13x + 3) \div (x - 5)$

What if the divisor has a coefficient in front of the variable?

Ex. $(2x^3 + 9x^2 + 14x + 5) \div (2x + 1)$

6. $(9x^3 - 18x^2 - x + 2) \div (3x + 1)$