Lesson Plan: Division of Polynomials

Subject: Mathematics
Course: IB Mathematics Analysis and Approaches
Level: IB HL
Topic: Division of Polynomials
Duration: 90 minutes

Learning Objective:

- Use long division and equating coefficients to divide polynomials.
- Interpret the quotient and remainder in the context of polynomial functions.

Prior Knowledge

- Structure of polynomials (terms, coefficients, degree)
- Polynomial operations (addition, subtraction, multiplication)
- Algebraic identities and basic equation solving

---

1. Opening Inquiry Question (10 minutes)

Question:
"When you divide a polynomial by another polynomial, what kind of result do you expect? Can we apply the same rules as with numbers?"

Discussion Prompt:

- What happens when a number isn't divisible evenly by another?

- What might the remainder look like in polynomial division?

- Can we write all polynomial divisions using:
  $f(x) = g(x) \cdot q(x) + r(x)$?

---

2. Concept Introduction (20 minutes)

Introduce the polynomial division algorithm:
$f(x) = g(x) \cdot q(x) + r(x)$, where $\deg(r) < \deg(g)$

Demonstrate polynomial long division using an example:
Divide $f(x) = 2x^3 - 3x^2 + 4x + 1$ by $g(x) = x - 2$

3. Inquiry Activity: Investigating Polynomial Division (25 minutes)

Group Activity:

- Assign each group a polynomial division problem.
- Students perform division and identify quotient, remainder, and factor status.
- Encourage each group to verify results using the division algorithm.

---

4. Concept Expansion: Equating Coefficients (15 minutes)

Introduce a second method of polynomial division using identities:

Example:
$3x^2 + 11x - 8 = (x + 5)(ax + b) + r$

Students expand, compare coefficients, and solve for a, b, and r.

---

5. Real-World Application & Interpretation (10 minutes)

Contextual Task:
Given a profit model as a polynomial, determine if a linear expression is a factor.
Use division to interpret break-even thresholds.

---

6. Reflection & Exit Ticket (10 minutes)

Exit Ticket Prompts:

- What do the quotient and remainder represent in polynomial division?
- Which method did you prefer: long division or equating coefficients? Why?
- How might this apply to real-world problem solving?

Assessment & Differentiation

Assessment:

- Observation during group work
- Accuracy of completed problems
- Exit ticket responses

Differentiation:

- Support struggling students with step-by-step scaffolding.
- Extend advanced learners with synthetic division or polynomial factorization.