

Rational functions AASL

Title: The Seesaw Balance - Understanding Rational Functions (Linear over Linear)

Concept: Rational Functions with a Linear Polynomial over Another Linear Polynomial



Intuition Pump: Visualize a seesaw in a playground, where the balance depends on the weights placed at each end. This balancing act is similar to a rational function where a linear polynomial is divided by another linear polynomial, with each side affecting how the function behaves.

1. Visual Analogy:

- Seesaw Mechanics: Think of the numerator (top linear polynomial) as the weight on one end of the seesaw, and the denominator (bottom linear polynomial) as the weight on the opposite end. The behavior of the seesaw (or function) changes as you adjust these weights. For example, where they balance or if one side touches the ground (approaches an asymptote when the denominator approaches zero).

- Movement and Changes: Just as shifting weights on a seesaw changes its tilt, changing coefficients in the numerator or denominator alters the slope and intercepts of the rational function graph.

2. Interactive Activity:

- Provide a set of weights (different coefficients) that students can place on a model seesaw or input into a graphing tool to see how the rational function $\frac{ax+b}{cx+d}$ changes.

Observe how adjustments lead to shifts in the graph, including changes in slopes and positions of asymptotes.

- Use an interactive graphing calculator or software to plot these functions and dynamically adjust the coefficients, visualizing the graph's response in real time.

3. Real-life Example:

- Discuss how this type of function can model situations where ratios or rates change under varying conditions, such as speed adjustments in a vehicle depending on different resistance factors or financial models predicting costs relative to revenues.

4. Mathematical Connection:

- Explore specific scenarios:

- What happens when the numerator and denominator are equal (the seesaw balances perfectly horizontal)?
- What occurs as the denominator approaches zero (one side of the seesaw lifts off the ground, representing vertical asymptotes)?
- Emphasize the importance of understanding the roots (zeros of the numerator) and poles (zeros of the denominator) and how they determine the function's behavior across its domain.

Using the "Seesaw Balance" analogy helps students grasp how linear-over-linear rational functions behave by comparing it to a familiar physical system. This visualization makes it easier to understand the impact of changes in the function's parameters, providing an intuitive foundation for more complex concepts in rational functions.