Introduction

What does it mean to add two polynomials? How is the graph of the sum related to the graphs of the addends? In this activity, you will add polynomials graphically and check to see that the result is the same as adding them algebraically.

Problem 1 – Adding Polynomials

Page 1.3 shows the graphs of two polynomials, $f(x)$ and $g(x)$. These graphs will be used to build $(f + g)(x)$.

- Drag the open circle on the x-axis. What happens to the values of $f(x)$ and $g(x)$?

After you have plotted 10 or more points, answer the following questions:

- When is the graph of $(f + g)(x)$ above the graphs of $f(x)$ and $g(x)$?
- When is it between the graphs of $f(x)$ and $g(x)$? When is it below?
- When does $(f + g)(x) = 0$? Explain.
- The degree of $f(x)$ is 3, and the degree of $g(x)$ is 3. What is the degree of $(f + g)(x)$?
- On page 1.6, the x- and y-values of the points you plotted are displayed. Choose a statistical regression and use it to find an equation for a curve through those points. Write that equation here.
- $f(x) = x^3+2x^2 – 5x$ and $g(x) = 2x^3 + 4x^2 – 3x + 6$, calculate $(f + g)(x)$ algebraically. Record your answer below and compare it to the regression equation.

Problem 2 – Subtracting Polynomials

On page 2.2, use the same steps to build the curve $(f – g)(x)$.

- When is the graph of $(f – g)(x)$ above the graphs of $f(x)$ and $g(x)$?
- When is it between the graphs of $f(x)$ and $g(x)$? When is it below?
- When does $(f – g)(x) = 0$?
- The degree of $f(x)$ is 4 and the degree of $g(x)$ is 4. What is the degree of $(f – g)(x)$?

- On page 2.4, the *x*- and *y*-values of the points you plotted are displayed. Choose a statistical regression and use it to find an equation for a curve through those points. Write that equation here.

- $f(x) = x^4 + 3x^3 - 2x^2 + 6x + 1$ and $g(x) = -x^4 + 3x^2 - 4x + 3$, calculate $(f - g)(x)$ algebraically. Record your answer below and compare it to the regression equation.

Problem 3 – Multiplying Polynomials

On page 3.2, use the same steps to build the curve $(f \cdot g)(x)$.

- The degree of $f(x)$ is 2 and the degree of $g(x)$ is 2. What is the degree of $(f \cdot g)(x)$?

- On page 3.3, the *x*- and *y*-values of the points you plotted are displayed. Choose a statistical regression and use it to find an equation for a curve through those points. Write that equation here.

- $f(x) = x^2 + 4$ and $g(x) = -2x^2 + 3x + 5$, calculate $(f \cdot g)(x)$ algebraically. Record your answer below and compare it to the regression equation.

Problem 4 – Dividing Polynomials

On page 4.2, use the same steps to build the curve $\left(\frac{f}{g}\right)(x)$.

- The degree of $f(x)$ is 3 and the degree of $g(x)$ is 1. What is the degree of $\left(\frac{f}{g}\right)(x)$?

- On page 4.3 the *x*- and *y*-values of the points you plotted are displayed. Choose a statistical regression and use it to find an equation for a curve through those points. Write that equation here.

- $f(x) = x^3 - x^2 + 3x + 5$ and $g(x) = x + 1$, calculate $\left(\frac{f}{g}\right)(x)$ algebraically. Record your answer below and compare it to the regression equation.