Graphs of Polynomial Functions

Name _____

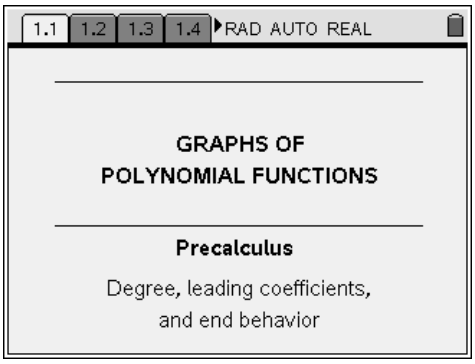
ID: 10222

Class _____

In this activity, you will explore:

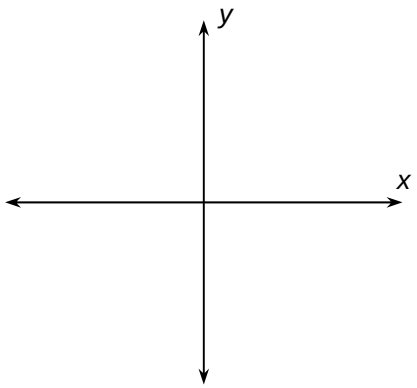
- *degree and leading coefficient of polynomials*
- *end behavior*
- *positive and negative infinity*

Open the file *PreCalcAct34_PolyGraphs_EN.tns* on your handheld and follow along with your teacher to work through the activity. Use this document as a reference and to record your answers.

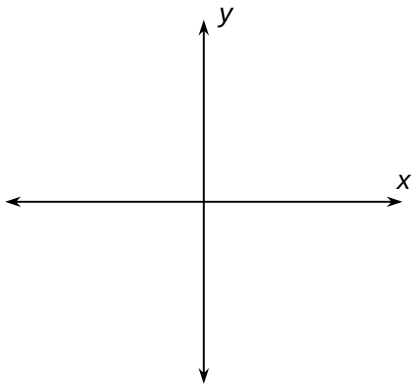


Problem 1 – Making comparisons

- Graph the functions below on page 1.3. Sketch the shapes of the graphs to the right.
  - **f1**$(x) = x^3 + x^2 + 1$
  - **f2**$(x) = x^5 - 2x^4 - 15x^3 - 4x^2 + 20x$
- How are these graphs alike?



- Graph the functions below on page 1.5. Sketch the shapes of the graphs to the right.
  - **f3**$(x) = -x^4 + 4x^3 + 7x^2 - 22x - 24$
  - **f4**$(x) = x^2 - 5x - 24$
- How is the graph of **f3** different than the graphs of **f1** and **f2**?

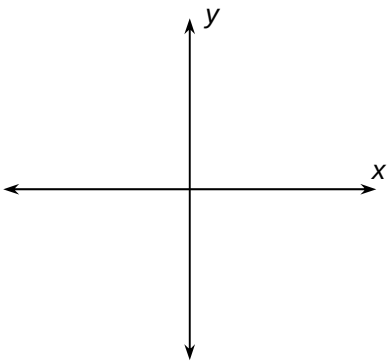


- How is the graph of **f4** similar to the graph of **f3**?

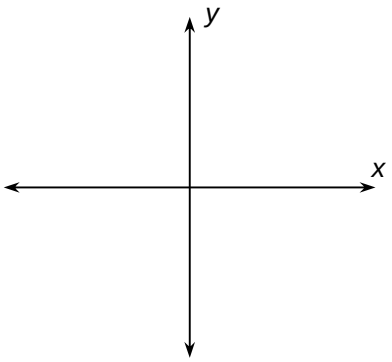
- What characteristic(s) of a function might affect its end behavior?

Problem 2 – Cubic functions

- Graph the functions below on page 2.2. Sketch the shapes of the graphs to the right.
  - **f1**$(x) = x^3 + 2x^2 - x - 2$
  - **f2**$(x) = -x^3 - 2x^2 + x + 2$



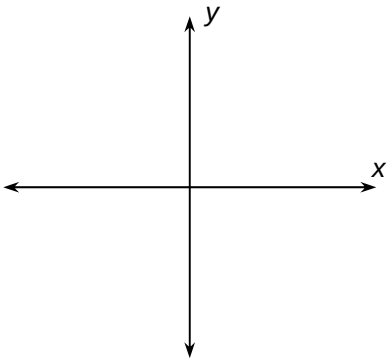
- On page 2.4, graph two more cubic functions—one in which the leading coefficient is positive and one in which it is negative. Sketch the shapes of the graphs to the right.
  - **f3**$(x) =$ _____
  - **f4**$(x) =$ _____



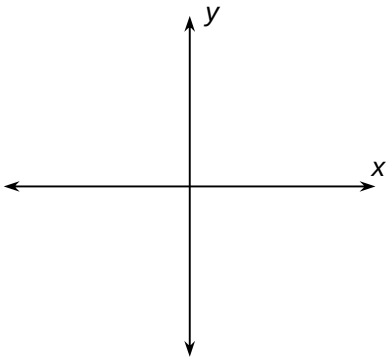
- Make a conjecture about the sign of the leading coefficient of a cubic function and the graph of the function.

Problem 3 – Quartic functions

- Graph the functions below on page 3.2. Sketch the shapes of the graphs to the right.
  - **f1**$(x) = x^4 + 3x^3 - 7x^2 - 15x + 18$
  - **f2**$(x) = -x^4 - 3x^3 + 7x^2 + 15x - 18$

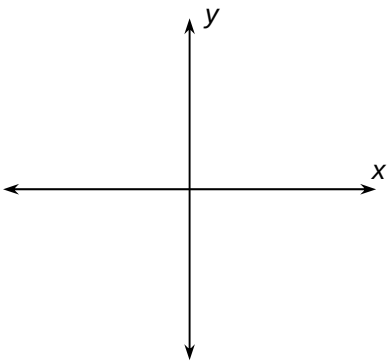


- On page 3.4, graph two more quartic functions—one in which the leading coefficient is positive and one in which it is negative. Sketch the shapes of the graphs to the right.
  - **f3**$(x) =$ _____
  - **f4**$(x) =$ _____

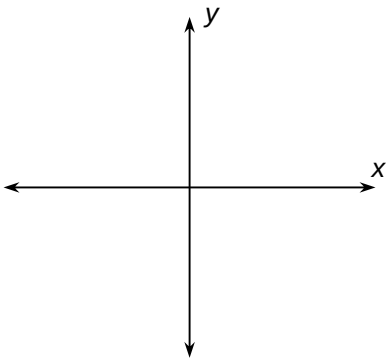


- Make a conjecture about the sign of the leading coefficient of a quartic function and the graph of the function.

Problem 4 – Quadratic and quartic functions



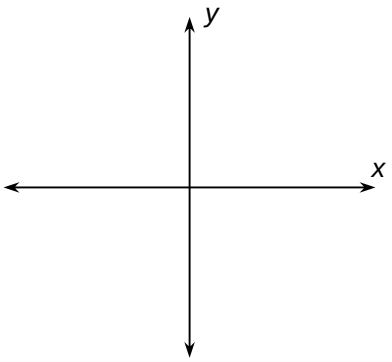
- On page 4.2, graph a quadratic function and a quartic function, both with *positive* leading coefficients. Sketch the shapes of the graphs to the right.
  - **f1**$(x) =$ _____
  - **f2**$(x) =$ _____



- On page 4.3, graph a quadratic function and a quartic function, both with *negative* leading coefficients. Sketch the shapes of the graphs to the right.
  - **f3**$(x) =$ _____
  - **f4**$(x) =$ _____

- Guess the end behavior of the graph of each function below.
  - $y = (x-2)^3(x+4)^3$
  - $y = -x^8$

Problem 5 – Cubic and quintic functions



- On page 5.2, graph a cubic function and a quintic function, both with *positive* leading coefficients. Sketch the shapes of the graphs to the right.
  - **f1**$(x) =$ _____
  - **f2**$(x) =$ _____

- On page 5.3, graph a cubic function and a quintic function, both with *negative* leading coefficients. Sketch the shapes of the graphs to the right.
  - **f3**$(x) =$ _____
  - **f4**$(x) =$ _____

- Guess the end behavior of the graph of each function below.
  - $y = (x-2)^4(x+3)^3$
  - $y = -x^9$

Problem 6 – Summarize your findings

- Explain how to determine the end behavior of the graph of a polynomial function based on its degree and the sign of the leading coefficient.

  (***Hint:*** There are four cases for you to consider.)