



## Explore End Behavior

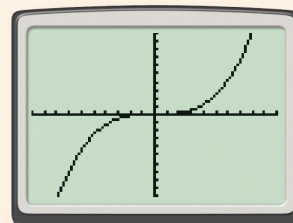
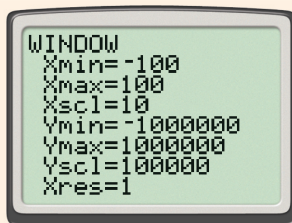
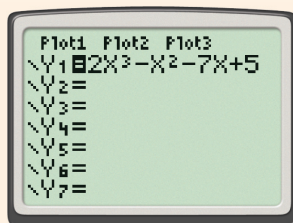
End behavior is a description of the values of the function as  $x$  approaches positive infinity ( $x \rightarrow +\infty$ ) or negative infinity ( $x \rightarrow -\infty$ ).

Use with Lesson 6-7

### Activity

Describe the end behavior of  $f(x) = 2x^3 - x^2 - 7x + 5$ .

Enter  $f(x)$  into your graphing calculator. Choose a large window, and graph.



Notice  $f(x)$  appears to rise for positive  $x$ -values and fall for negative  $x$ -values.

### Try This

- Consider the functions  $g(x) = 3x^3 - 2x^2 + x + 4$ ,  $h(x) = \frac{1}{2}x^3 + 3x^2 + x - 9$ , and  $k(x) = 5x^3 - 8x^2 - 2x + 1$ .
  - What do the functions  $g(x)$ ,  $h(x)$ , and  $k(x)$  have in common?
  - Graph  $g(x)$ ,  $h(x)$ , and  $k(x)$  on your graphing calculator, and describe the end behavior of each.
  - Make a Conjecture** What can you say about the end behavior of functions of the same type as  $g(x)$ ,  $h(x)$ , and  $k(x)$ ?
- Consider the functions  $a(x) = -3x^3 - 2x^2 + x + 4$ ,  $b(x) = -\frac{1}{2}x^3 + 3x^2 + x - 9$ , and  $c(x) = -5x^3 - 8x^2 - 2x + 1$ .
  - What do the functions  $a(x)$ ,  $b(x)$ , and  $c(x)$  have in common?
  - Graph  $a(x)$ ,  $b(x)$ , and  $c(x)$  on your graphing calculator, and describe the end behavior of each.
  - Make a Conjecture** What can you say about the end behavior of functions of the same type as  $a(x)$ ,  $b(x)$ , and  $c(x)$ ?
- Consider the functions  $p(x) = 3x^4 - x^2 + x + 4$ ,  $r(x) = \frac{1}{2}x^4 + 3x^3 + x - 9$ , and  $s(x) = 5x^4 - 8x^3 - 2x^2 + 1$ .
  - What do the functions  $p(x)$ ,  $r(x)$ , and  $s(x)$  have in common?
  - Graph  $p(x)$ ,  $r(x)$ , and  $s(x)$  on your graphing calculator, and describe the end behavior of each.
  - Make a Conjecture** What can you say about the end behavior of functions of the same type as  $p(x)$ ,  $r(x)$ , and  $s(x)$ ?
- Critical Thinking** Compare your conjectures from Problems 1c, 2c, and 3c. What are the characteristics of a function that seem to affect the function's end behavior?

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