

5.2 End Behavior of Polynomial Functions

TEKS a.5, a.6, 2A.4.A; P.1.E

MATERIALS • graphing calculator

QUESTION How is the end behavior of a polynomial function related to the function's equation?

Functions of the form $f(x) = \pm x^n$, where n is a positive integer, are examples of *polynomial functions*. The *end behavior* of a polynomial function's graph is its behavior as x approaches positive infinity ($+\infty$) or as x approaches negative infinity ($-\infty$).

EXPLORE Investigate the end behavior of $f(x) = \pm x^n$ where n is even

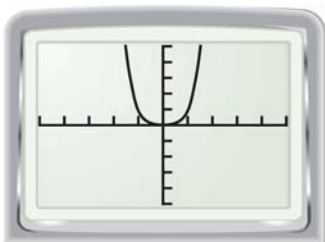
Graph the function. Describe the end behavior of the graph.

a. $f(x) = x^4$

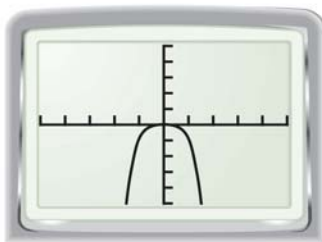
b. $f(x) = -x^4$

STEP 1 *Graph functions* Graph each function on a graphing calculator.

a.



b.



STEP 2 *Describe end behavior* Summarize the end behavior of each function.

Function	As x approaches $-\infty$	As x approaches $+\infty$
a. $f(x) = x^4$	$f(x)$ approaches $+\infty$	$f(x)$ approaches $+\infty$
b. $f(x) = -x^4$	$f(x)$ approaches $-\infty$	$f(x)$ approaches $-\infty$

DRAW CONCLUSIONS Use your observations to complete these exercises

Graph the function. Then describe its end behavior as shown above.

1. $f(x) = x^5$ 2. $f(x) = -x^5$ 3. $f(x) = x^6$ 4. $f(x) = -x^6$

5. Make a conjecture about the end behavior of each family of functions.

a. $f(x) = x^n$ where n is odd

b. $f(x) = -x^n$ where n is odd

c. $f(x) = x^n$ where n is even

d. $f(x) = -x^n$ where n is even

6. Make a conjecture about the end behavior of the function $f(x) = x^6 - x$. Explain your reasoning.