

Exercise Set A



- MM1A1b** Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.
- MM1A1c** Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x - and y -axes.
- MM1A1d** Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.
- MM1A1h** Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

Describe the end behavior of the graph of the function.

1. $f(x) = x^3$
2. $f(x) = -3x^3$
3. $f(x) = \frac{1}{2}x^3 - 2$

Graph the function. Compare the graph with the graph of $y = x^3$.

4. $y = x^3 + 1$
5. $y = x^3 - 2$
6. $y = 4x^3$
7. $y = -2x^3$
8. $y = -x^3 - 1$
9. $y = \frac{1}{3}x^3 + 1$

Tell whether the function is even, odd, or neither.

10. $f(x) = -x^3$
11. $f(x) = 5x^3$
12. $f(x) = x^2 + 4$
13. $f(x) = x^3 - x^2$
14. $f(x) = -x^3 + 2x$
15. $f(x) = x^3 + 4x + 1$

16. **Error Analysis** Describe and correct the student's error in analyzing the function $f(x) = x^3 + x$.

The function is an odd function because

$$\begin{aligned} f(-x) &= (-x)^3 + (-x) \\ &= -x - x = -f(x). \end{aligned}$$

So the function is symmetric about the y -axis.



17. **Multiple Representations** The number of fish F in a small pond t years after 2000 can be modeled by the function $F = t^3 - 9t^2 + 18t + 12$.

a. **Making a Table** Copy and complete the table.

| | | | | | | | | |
|--|---|---|---|---|---|---|---|---|
| t (years since 2000) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| F (number of fish) | ? | ? | ? | ? | ? | ? | ? | ? |

b. **Drawing a Graph** Use the table to graph the function.

c. **Interpreting a Graph** Did the number of fish increase or decrease between 2002 and 2004?



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- MM1A1c** Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x - and y -axes.
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Describe the end behavior of the graph of the function.

1. $f(x) = -x^3 - 2x$
2. $f(x) = -\frac{2}{3}x^3 + 2$
3. $f(x) = 0.4x^3 - 2x^2$
4. **Open-Ended** Give an example of a transformation or a series of transformations that would change the end behavior of a function.

Graph the function. Compare the graph with the graph of $y = x^3$.

5. $y = 3x^3 - 2$
6. $y = -2x^3 + 1$
7. $y = -\frac{3}{4}x^3$
8. **Multiple Choice** The graph of which function is a vertical stretch and a reflection in the x -axis of the graph of $y = x^3$?
 - A. $y = -5x^3$
 - B. $y = -\frac{3}{4}x^3$
 - C. $y = -x^3 + 4$
 - D. $y = 2x^3$

Tell whether the function is even, odd, or neither.

9. $f(x) = \frac{1}{2}x^3 + 9x$
10. $f(x) = -5x^2 - 9$
11. $f(x) = x^3 - x + 1$
12. **Reasoning** Can a cubic function be an even function? *Explain* your answer algebraically. Also explain your answer using what you know about the end behavior of cubic functions.

13. Stock Market The balance B (in thousands of dollars) in Ed's stock market account between 2000 and 2007 can be modeled by the cubic function graphed at the right, where t is the number of years since 2000.

- a. How much was in Ed's account in 2000?
- b. Between what years did his account value decrease?
- c. Between what years did his account value increase?

