LESSON 3.1	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 <i>x</i> - and <i>y</i> -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.** $f(x) = \frac{1}{2}x^3 - 2$

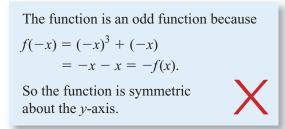
Graph the function. *Compare* the graph with the graph of $y = x^3$.

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 $f(x) = x^3 + x$.



- **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.

<i>t</i> (years since 2000)	0	1	2	3	4	5	6	7
<i>F</i> (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?

0.4	Exercise Set B		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 <i>x</i> - and <i>y</i> -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.** $f(x) = -x^3 2x$ **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.** $f(x) = x^3 - x + 1$

Unit 3

- **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?

