

5-9

Practice

Form G

Transforming Polynomial Functions

Determine the cubic function that is obtained from the parent function $y = x^3$ after each sequence of transformations.

- a reflection in the x -axis; a vertical translation 3 units down; and a horizontal translation 2 units right
- a vertical stretch by a factor of 4; a reflection in the x -axis; and a horizontal translation $\frac{1}{2}$ unit left
- a vertical stretch by a factor of $\frac{1}{3}$; a reflection in the y -axis; and a vertical translation 6 units up
- a vertical stretch by a factor of 3; a reflection in the x -axis; a vertical translation 2 units down; and a horizontal translation 2 units left

Find all the real zeros of each function.

- $y = 2(x + 1)^3 - 3$
- $y = -3(x - 2)^3 + 24$
- $y = -\frac{1}{2}(x + 4)^3 - 1$
- $y = 8(-x - 2)^3 + 5$
- $y = -(x + 5)^3 + 1$
- $y = 4(x - 6)^3 - 2$

Find a quartic function with the given x -values as its only real zeros.

- $x = 2$ and $x = 8$
- $x = 3$ and $x = -1$
- $x = 1$ and $x = 3$
- $x = -2$ and $x = 6$
- $x = 5$ and $x = -2$
- $x = -1$ and $x = 2$
- $x = -3$ and $x = -5$
- $x = -4$ and $x = 4$

- 19. Physics** If you stretch a spring to 5 ft, it has 310 ft-lb of potential energy (PE). Potential energy varies directly as the square of the stretched length (l). The potential energy can be represented by the formula $PE = \frac{1}{2}kl^2$, where k is the spring constant.

- What is the value of the spring constant for this spring?
- How many ft-lbs of PE would an 8 ft length of spring have?

5-9**Practice** (continued)

Form G

Transforming Polynomial Functions

Determine whether each function can be obtained from the parent function $y = x^n$, using basic transformations. If so, describe the sequence of transformations.

20. $y = 2(x - 3)^3 + 4$

21. $y = x^4 + x - 3$

22. $y = -\frac{1}{3}x^2$

23. $y = (-x + 5)^3$

24. $y = \frac{2}{x^3}$

25. $y = 4(x)^4 - 12$

26. Graph the parent function $y = x^3$ after it has been transformed by the following changes.

- vertical stretch by a factor of $2\frac{1}{4}$
- reflection across the x -axis
- vertical translation 4 units up

27. **Error Analysis** Your friend set up a problem to find a quartic function with the only real zeros of $x = -4$ and $x = 1$. She wrote down $y = (x + 4)(x - 1)(x^2 - 1)$. Will she get a correct quartic function? Why or why not?

28. **Open-Ended** Transform the parent function $y = x^3$ by vertical stretch, reflection across the x -axis, horizontal translation, and vertical translation.

29. You are swinging a bucket in a circle at a velocity of 7.8 ft/s. The radius of the circle you are making is 1.25 ft. The acceleration is equal to one over the radius multiplied by the velocity squared.

- a. What is the acceleration of the bucket?
- b. What is the velocity if the acceleration is 25 ft/sec²?