

Chapter 5

12. $(f + g)(x) = f(x) + g(x) = 6x^{3/5} - x^{3/5} = 5x^{3/5}$

The functions f and g each have the same domain: all real numbers. So, the domain of $f + g$ is all real numbers. When $x = 32$, the value of the sum is

$$(f + g)(32) = 5(32)^{3/5} = 5(8) = 40.$$

$$(f - g)(x) = f(x) - g(x) = 6x^{3/5} + x^{3/5} = 7x^{3/5}$$

The functions f and g each have the same domain: all real numbers. So, the domain of $f - g$ is all real numbers. When $x = 32$, the value of the difference is

$$(f - g)(32) = 7(32)^{3/5} = 7(8) = 56.$$

13. $(fg)(x) = f(x)g(x) = \left(\frac{1}{2}x^{3/4}\right)(8x) = 4x^{7/4}$

The domain of f is $x \geq 0$ and the domain of g is all real numbers. So, the domain of fg is $x \geq 0$. When $x = 16$, the value of the product is

$$(fg)(16) = 4(16)^{7/4} = 4(128) = 512.$$

$$\left(\frac{f}{g}\right)(x) = \frac{\frac{1}{2}x^{3/4}}{8x} = \frac{1}{16x^{1/4}}$$

The domain of f is $x \geq 0$ and the domain of g is all real numbers. So, the domain of $\frac{f}{g}$ consists of $x > 0$. When $x = 16$, the value of the quotient is

$$\left(\frac{f}{g}\right)(16) = \frac{1}{16(16)^{1/4}} = \frac{1}{16(2)} = \frac{1}{32}.$$

14. $h = \frac{1}{64}s^2$

$$64h = s^2$$

$$\sqrt{64h} = s$$

$$8\sqrt{h} = s$$

The initial speed of the player is about $8\sqrt{3} \approx 13.9$ feet per second.

Step 1 Show that $h(s(h)) = h$.

$$\begin{aligned} h(s(h)) &= h(8\sqrt{h}) \\ &= \frac{1}{64}(8\sqrt{h})^2 \\ &= \frac{1}{64}(64h) \\ &= h \quad \checkmark \end{aligned}$$

Step 2 Show that $s(h(s)) = s$.

$$\begin{aligned} s(h(s)) &= s\left(\frac{1}{64}s^2\right) \\ &= 8\sqrt{\frac{1}{64}s^2} \\ &= 8 \cdot \frac{1}{8}s \\ &= s \quad \checkmark \end{aligned}$$

Chapter 5 Standards Assessment (pp. 290–291)

1. The pairs of equivalent expressions are

1. a and $\sqrt[n]{a^n}$ because $\sqrt[n]{a^n} = a^{n/n} = a$.
2. $a^{1/n}$ and $\sqrt[n]{a}$ because $a^{1/n} = \sqrt[n]{a}$.
3. $(\sqrt{a})^n$ and $\sqrt{a^n}$ because $(\sqrt{a})^n = \sqrt{a^n}$.

2. The parent function is $y = x^2$. The graph has been translated 3 units left and 2 units up. So, the function is $f(x) = (x - (-3))^2 + 2$.

3. a. $n = 2$: $s = 4.62\sqrt[9]{2} \approx 5.0$ m/sec

$$n = 4$$
: $s = 4.62\sqrt[9]{4} \approx 5.4$ m/sec

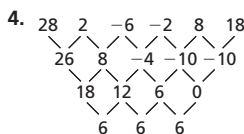
$$n = 8$$
: $s = 4.62\sqrt[9]{8} \approx 5.8$ m/sec

b. no; the boat speed does not double when the number of people are doubled because of the ninth root, so it increases by a factor of $2^{1/9}$.

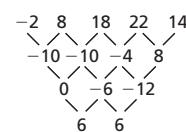
c. $n = 2$: $\frac{2000}{4.99} \approx 400.8$ sec = 400.8 sec $\cdot \frac{1 \text{ min}}{60 \text{ sec}} \approx 6.7$ min

$$n = 4$$
: $\frac{2000}{5.39} \approx 371.1$ sec = 371.1 sec $\cdot \frac{1 \text{ min}}{60 \text{ sec}} \approx 6.2$ min

$$n = 8$$
: $\frac{2000}{5.82} \approx 343.6$ sec = 343.6 sec $\cdot \frac{1 \text{ min}}{60 \text{ sec}} \approx 5.7$ min



The third differences are constant, so the degree of the polynomial is 3. Work backwards to find the missing values in the table.



5. 18 minus what number is -4?
6. 22 minus what number is 8?
3. -10 minus what number is -6?
4. -4 minus what number is -12?
1. 0 minus what number is 6?
2. -6 minus what number is 6?

The missing values are 22 and 14.

5. $42 = \frac{1}{2}(x + 8)x$

$$84 = (x + 8)x$$

$$84 = x^2 + 8x$$

$$0 = x^2 + 8x - 84$$

$$0 = (x - 6)(x + 14)$$

$$x - 6 = 0 \quad \text{or} \quad x + 14 = 0$$

$$x = 6 \quad \text{or} \quad x = -14$$

Reject the negative solution because a negative length does not make sense. So, $x = 6$.

Chapter 5

6.

Equation	Parabola	Function
$y = (x + 3)^2$	✓	✓
$x = 4y^2 - 2$	✓	
$y = (x - 1)^{1/2} + 6$		✓
$y^2 = 10 - x^2$		

Parabolas are of the form $y = x^2$ or $x = y^2$. There are two equations in the table that are parabolas. Two of the equations represent functions because they pass the Vertical Line Test but the other two do not.

7. C; $2\sqrt{x+3} - 1 < 3$
 $2\sqrt{x+3} < 4$
 $\sqrt{x+3} < 2$
 $x+3 < 4$
 $x < 1$

Consider the radicand.

$$x + 3 \geq 0$$

$$x \geq -3$$

So, the solution is $-3 \leq x < 1$.

8. C; The graph is a horizontal shrink by a factor of $\frac{1}{2}$ and a translation 1 unit down of the parent absolute value function.

9. $d = \sqrt{2500 + h^2}$
 $d^2 = 2500 + h^2$

$$d^2 - 2500 = h^2$$

$$\sqrt{d^2 - 2500} = h$$

When $d = 100$: $h = \sqrt{100^2 - 2500} = \sqrt{7500} \approx 87$

So, the height of the balloon is about 87 feet.

10. They are not inverse functions because they are not reflections of each other in the line $y = x$.