In Exercises 1–6, find the domain and range of each function.

1. \( f(x) = 1 + x^2 \)
2. \( f(x) = 1 - \sqrt{x} \)
3. \( F(t) = \frac{1}{\sqrt{t}} \)
4. \( F(t) = \frac{1}{1 + \sqrt{t}} \)
5. \( g(z) = \sqrt{4 - z^2} \)
6. \( g(z) = \frac{1}{\sqrt{4 - z^2}} \)

In Exercises 7 and 8, which of the graphs are graphs of functions of \( x \), and which are not? Give reasons for your answers.

**7.**

<table>
<thead>
<tr>
<th>a.</th>
<th><img src="image1" alt="Graph a" /></th>
<th>b.</th>
<th><img src="image2" alt="Graph b" /></th>
</tr>
</thead>
</table>

**8.**

<table>
<thead>
<tr>
<th>a.</th>
<th><img src="image3" alt="Graph a" /></th>
<th>b.</th>
<th><img src="image4" alt="Graph b" /></th>
</tr>
</thead>
</table>

**38.** The figure shown here shows a rectangle inscribed in an isosceles right triangle whose hypotenuse is 2 units long.

a. Express the \( y \)-coordinate of \( P \) in terms of \( x \). (You might start by writing an equation for the line \( AB \).)

b. Express the area of the rectangle in terms of \( x \).

**39. A cone problem** Begin with a circular piece of paper with a 4 in. radius as shown in part (a). Cut out a sector with an arc length of \( x \). Join the two edges of the remaining portion to form a cone with radius \( r \) and height \( h \), as shown in part (b).

<table>
<thead>
<tr>
<th><img src="image5" alt="Diagram a" /></th>
<th><img src="image6" alt="Diagram b" /></th>
</tr>
</thead>
</table>

- a. Explain why the circumference of the base of the cone is \( 8\pi - x \).
- b. Express the radius \( r \) as a function of \( x \).
- c. Express the height \( h \) as a function of \( x \).
- d. Express the volume \( V \) of the cone as a function of \( x \).
5. If \( f(x) = x + 5 \) and \( g(x) = x^2 - 3 \), find the following.
   a. \( f(g(0)) \)
   b. \( g(f(0)) \)
   c. \( f(g(x)) \)
   d. \( g(f(x)) \)
   e. \( f(f(-5)) \)
   f. \( g(g(2)) \)
   g. \( f(f(x)) \)
   h. \( g(g(x)) \)

6. If \( f(x) = x - 1 \) and \( g(x) = \frac{1}{x + 1} \), find the following.
   a. \( f(g(1/2)) \)
   b. \( g(f(1/2)) \)
   c. \( f(g(x)) \)
   d. \( g(f(x)) \)
   e. \( f(f(2)) \)
   f. \( g(g(2)) \)
   g. \( f(f(x)) \)
   h. \( g(g(x)) \)

In Exercises 13 and 14, (a) write a formula for \( f \circ g \) and \( g \circ f \) and find the (b) domain and (c) range of each.

13. \( f(x) = \sqrt{x + 1}, \ g(x) = \frac{1}{x} \)
14. \( f(x) = x^2, \ g(x) = 1 - \sqrt{x} \)

15. The accompanying figure shows the graph of \( y = -x^2 \) shifted to two new positions. Write equations for the new graphs.

16. The accompanying figure shows the graph of \( y = x^2 \) shifted to two new positions. Write equations for the new graphs.

17. Match the equations listed in parts (a)–(d) to the graphs in the accompanying figure.
   a. \( y = (x - 1)^2 - 4 \)
   b. \( y = (x - 2)^2 + 2 \)
   c. \( y = (x + 2)^2 + 2 \)
   d. \( y = (x + 3)^2 - 2 \)

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