

## 1.3.1 EXERCISES

To see all of the help resources associated with this section, click [OSttS Chapter 1a](#).

In Exercises 1 - 12, determine whether or not the relation represents  $y$  as a function of  $x$ . Find the domain and range of those relations which are functions.

For help with these exercises, click on one or more of the resources below:

- [Determining which relations are functions](#)
- [Finding domain and range](#)

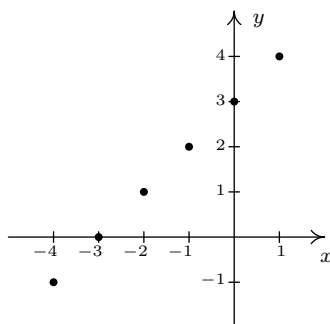
1.  $\{(-3, 9), (-2, 4), (-1, 1), (0, 0), (1, 1), (2, 4), (3, 9)\}$
2.  $\{(-3, 0), (1, 6), (2, -3), (4, 2), (-5, 6), (4, -9), (6, 2)\}$
3.  $\{(-3, 0), (-7, 6), (5, 5), (6, 4), (4, 9), (3, 0)\}$
4.  $\{(1, 2), (4, 4), (9, 6), (16, 8), (25, 10), (36, 12), \dots\}$
5.  $\{(x, y) \mid x \text{ is an odd integer, and } y \text{ is an even integer}\}$
6.  $\{(x, 1) \mid x \text{ is an irrational number}\}$
7.  $\{(1, 0), (2, 1), (4, 2), (8, 3), (16, 4), (32, 5), \dots\}$
8.  $\{\dots, (-3, 9), (-2, 4), (-1, 1), (0, 0), (1, 1), (2, 4), (3, 9), \dots\}$
9.  $\{(-2, y) \mid -3 < y < 4\}$
10.  $\{(x, 3) \mid -2 \leq x < 4\}$
11.  $\{(x, x^2) \mid x \text{ is a real number}\}$
12.  $\{(x^2, x) \mid x \text{ is a real number}\}$

In Exercises 13 - 32, determine whether or not the relation represents  $y$  as a function of  $x$ . Find the domain and range of those relations which are functions.

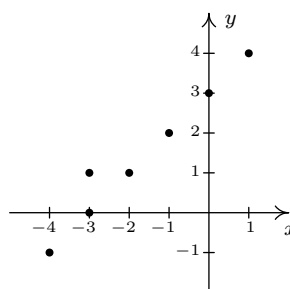
For help with these exercises, click one or more of the resources below:

- [Determine if a graph represents  \$y\$  as a function of  \$x\$  \(Vertical Line Test\)](#)
- [Finding domain and range from a graph](#)

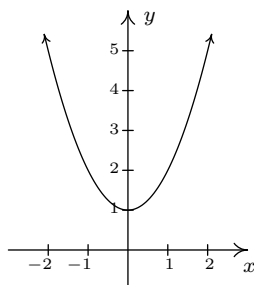
13.



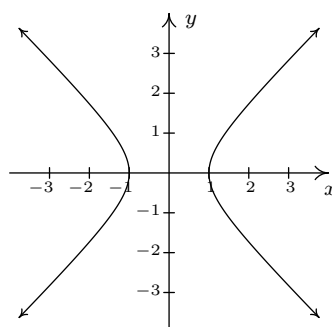
14.



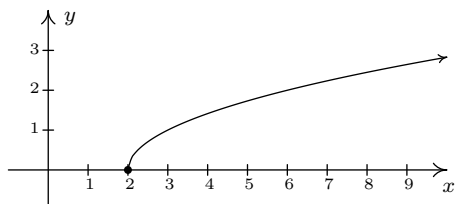
15.



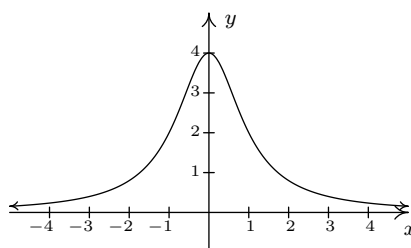
16.



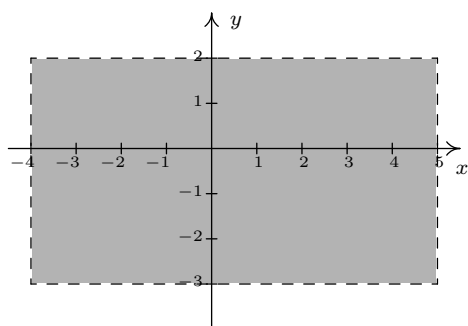
17.



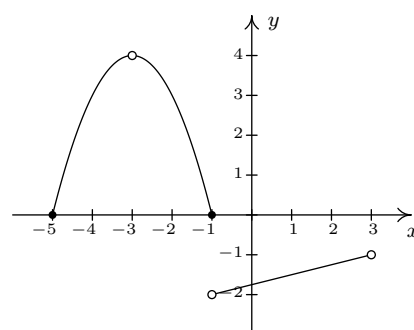
18.



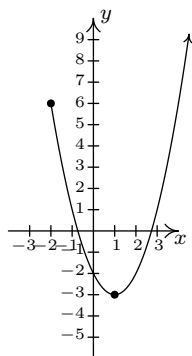
19.



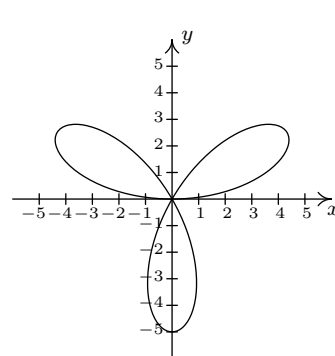
20.



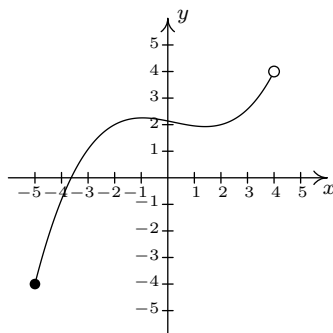
21.



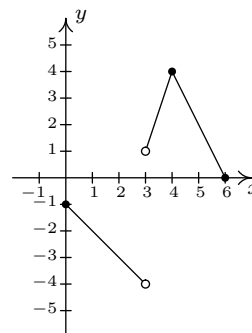
22.



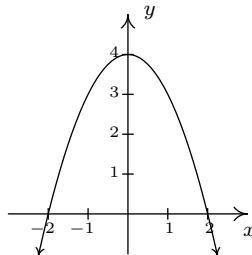
23.



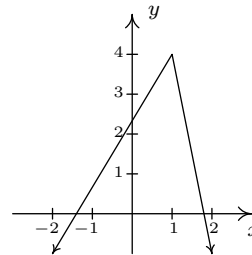
24.



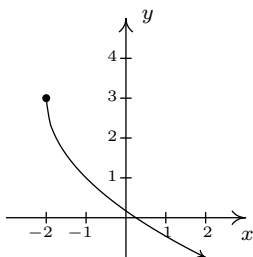
25.



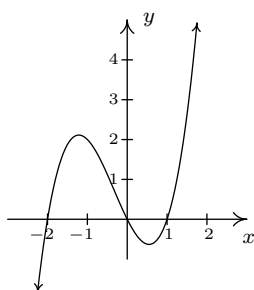
26.



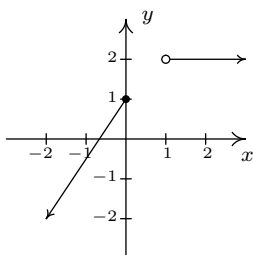
27.



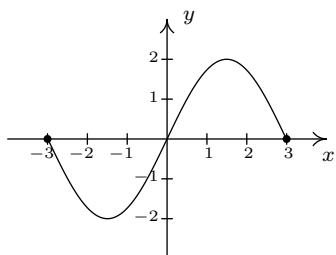
28.



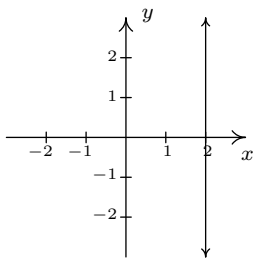
29.



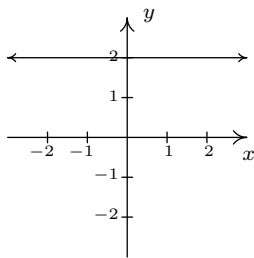
30.



31.



32.



In Exercises 33 - 47, determine whether or not the equation represents  $y$  as a function of  $x$ . For help with these exercises, click [determining when an equation represents  \$y\$  as a function of  \$x\$](#) .

33.  $y = x^3 - x$

34.  $y = \sqrt{x - 2}$

35.  $x^3 y = -4$

36.  $x^2 - y^2 = 1$

37.  $y = \frac{x}{x^2 - 9}$

38.  $x = -6$

39.  $x = y^2 + 4$

40.  $y = x^2 + 4$

41.  $x^2 + y^2 = 4$

42.  $y = \sqrt{4 - x^2}$

43.  $x^2 - y^2 = 4$

44.  $x^3 + y^3 = 4$

45.  $2x + 3y = 4$

46.  $2xy = 4$

47.  $x^2 = y^2$

48. Explain why the population  $P$  of Sasquatch in a given area is a function of time  $t$ . What would be the range of this function?

49. Explain why the relation between your classmates and their email addresses may not be a function. What about phone numbers and Social Security Numbers?

The process given in Example 1.3.5 for determining whether an equation of a relation represents  $y$  as a function of  $x$  breaks down if we cannot solve the equation for  $y$  in terms of  $x$ . However, that does not prevent us from proving that an equation fails to represent  $y$  as a function of  $x$ . What we really need is two points with the same  $x$ -coordinate and different  $y$ -coordinates which both satisfy the equation so that the graph of the relation would fail the Vertical Line Test 1.1. Discuss with your classmates how you might find such points for the relations given in Exercises 50 - 53.

50.  $x^3 + y^3 - 3xy = 0$

51.  $x^4 = x^2 + y^2$

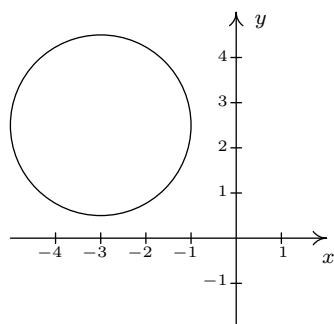
52.  $y^2 = x^3 + 3x^2$

53.  $(x^2 + y^2)^2 = x^3 + y^3$

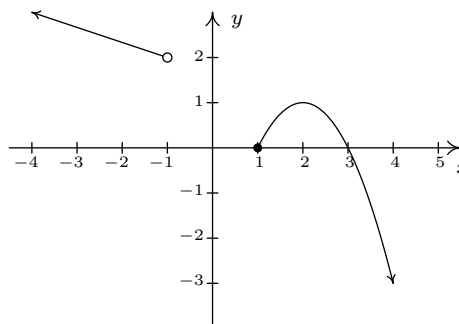
### Checkpoint Quiz 1.3

1. Determine if the relation whose graph is below represents  $y$  as a function of  $x$ . If so, state the domain and range using interval notation.

(a)



(b)



2. Does the equation  $y^2 - y^2x = 1$  describe  $y$  as a function of  $x$ ? Explain.

For worked out solutions to this quiz, click the link below:

- [Quiz Solution](#)

## 1.3.2 ANSWERS

1. Function  
domain =  $\{-3, -2, -1, 0, 1, 2, 3\}$   
range =  $\{0, 1, 4, 9\}$
2. Not a function
3. Function  
domain =  $\{-7, -3, 3, 4, 5, 6\}$   
range =  $\{0, 4, 5, 6, 9\}$
4. Function  
domain =  $\{1, 4, 9, 16, 25, 36, \dots\}$   
 $= \{x \mid x \text{ is a perfect square}\}$   
range =  $\{2, 4, 6, 8, 10, 12, \dots\}$   
 $= \{y \mid y \text{ is a positive even integer}\}$
5. Not a function
6. Function  
domain =  $\{x \mid x \text{ is irrational}\}$   
range =  $\{1\}$
7. Function  
domain =  $\{x \mid x = 2^n \text{ for some whole number } n\}$   
range =  $\{y \mid y \text{ is any whole number}\}$
8. Function  
domain =  $\{x \mid x \text{ is any integer}\}$   
range =  $\{y \mid y = n^2 \text{ for some integer } n\}$
9. Not a function
10. Function  
domain =  $[-2, 4)$ , range =  $\{3\}$
11. Function  
domain =  $(-\infty, \infty)$   
range =  $[0, \infty)$
12. Not a function
13. Function  
domain =  $\{-4, -3, -2, -1, 0, 1\}$   
range =  $\{-1, 0, 1, 2, 3, 4\}$
14. Not a function
15. Function  
domain =  $(-\infty, \infty)$   
range =  $[1, \infty)$
16. Not a function
17. Function  
domain =  $[2, \infty)$   
range =  $[0, \infty)$
18. Function  
domain =  $(-\infty, \infty)$   
range =  $(0, 4]$
19. Not a function
20. Function  
domain =  $[-5, -3) \cup (-3, 3)$   
range =  $(-2, -1) \cup [0, 4)$

21. Function  
domain =  $[-2, \infty)$   
range =  $[-3, \infty)$
23. Function  
domain =  $[-5, 4)$   
range =  $[-4, 4)$
25. Function  
domain =  $(-\infty, \infty)$   
range =  $(-\infty, 4]$
27. Function  
domain =  $[-2, \infty)$   
range =  $(-\infty, 3]$
29. Function  
domain =  $(-\infty, 0] \cup (1, \infty)$   
range =  $(-\infty, 1] \cup \{2\}$
31. Not a function
33. Function
36. Not a function
39. Not a function
42. Function
45. Function
22. Not a function
24. Function  
domain =  $[0, 3) \cup (3, 6]$   
range =  $(-4, -1] \cup [0, 4]$
26. Function  
domain =  $(-\infty, \infty)$   
range =  $(-\infty, 4]$
28. Function  
domain =  $(-\infty, \infty)$   
range =  $(-\infty, \infty)$
30. Function  
domain =  $[-3, 3]$   
range =  $[-2, 2]$
32. Function  
domain =  $(-\infty, \infty)$   
range =  $\{2\}$
34. Function
37. Function
40. Function
43. Not a function
46. Function
35. Function
38. Not a function
41. Not a function
44. Function
47. Not a function