Solutions to 2.3:

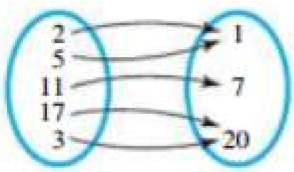
9. $\{(1,1),(1,-1),(0,0),(2,4),(2,-4)\}$

Not a function because (1,1) and (1,-1)
Also because (2,4) and (2,-4)
Domain (all x's) {1,0,2}
Range (all y's) {1,-1,0,4,-4}

10. $\{(2,5),(3,7),(3,9),(5,11)\}$

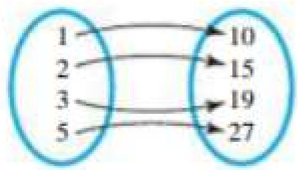
Not a function because (3,7) and (3,9)
Domain {1, 2, 5}
Range {5, 7, 9, 11}

11.



Yes a function. Each x number (on the left) has only one arrow.
Domain {2, 5, 11, 17, 3}
Range {1, 7, 20}

12.



Yes a function. Each x number (on the left) has only one arrow
Domain: {1, 2, 3, 5}
Range: {10, 15, 19, 27}

13.

x	y
0	0
−1	1
−2	2

Yes, a function:
all x's appear only once
Domain {0, -1, -2}
Range: {0, 1, 2}

14.

x	y
0	0
1	−1
2	−2

Yes, a function:
all x's appear only once
Domain {0, 1, 2}
Range {0, -1, -2}

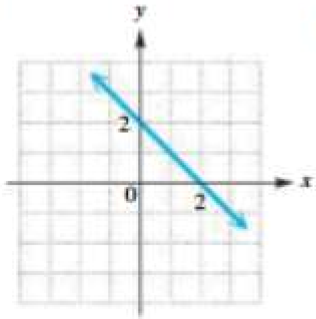
15. ***Number of Visits to U.S. National Parks***

Year (x)	Number of Visits (y) (millions)
2005	63.5
2006	60.4
2007	62.3
2008	61.2

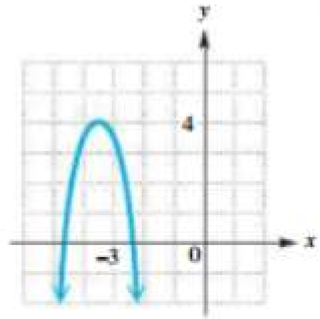
Source: National Park Service.

Yes, it's a function, each year has only one number associated with it
Domain: {2005, 2006, 2007, 2008}
Range {63.5 million, 60.4 million, 62.3 million, 61.2 million}

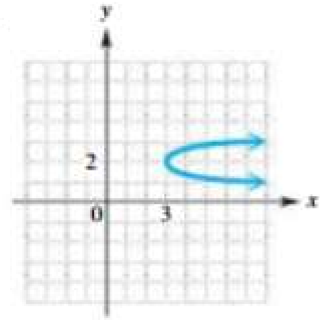
17.



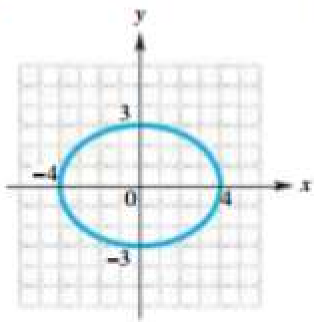
18.



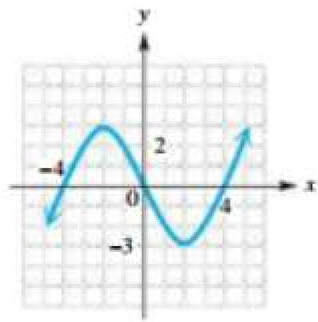
19.



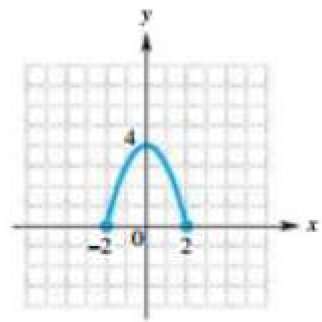
20.



21.



22.



I only assigned 17, 19, 20, and 22 but these are so fast, I'll tell you answers to most of them
17, 18, 19, 21 and 22 are functions. 19 and 20 are not functions because they fail the "vertical line test": there is an x-value that has two or more y-values. Examples of non-function relationships are:
19. has points (6,1) and (6,3) 20. has points (0,3) and (0,-3)
Arrows mean that the functions continue in the given directions, so domains and ranges are:
17. Domain $(-\infty,\infty)$, Range $(-\infty,\infty)$
18. Domain $(-\infty,\infty)$, Range: $(-\infty,4]$
19. Domain $[3,\infty)$, Range $(-\infty,\infty)$
20. Domain [-4,4], Range [-3,3]
21. Domain $(-\infty,\infty)$, Range $(-\infty,\infty)$
22. Domain [-2,2], Range [0,4]

25. $x = y^6$ includes the points (1, 1) and (1, -1) so it is not a function
Domain $[0,\infty)$, Range $(-\infty,\infty)$
31. $y = \sqrt{x}$ This is a function, because $\sqrt{x}$ is the name for just the positive square root.
Domain: $[0,\infty)$ because we are only allowing real inputs and outputs for these functions. That means we can only allow non-negative inputs (because negative inputs would give us imaginary outputs). Range $[0,\infty)$

These are the problems I meant to assign. They are from section 2.8 not 2.5:

*Given functions f and g, find **(a)** $(f \circ g)(x)$ and its domain, and **(b)** $(g \circ f)(x)$ and its domain. **See Examples 6 and 7.***

63. $f(x) = -6x + 9,\quad g(x) = 5x + 7$

64. $f(x) = 8x + 12,\quad g(x) = 3x - 1$

65. $f(x) = \sqrt{x},\quad g(x) = x + 3$

66. $f(x) = \sqrt{x},\quad g(x) = x - 1$

67. $f(x) = x^3,\quad g(x) = x^2 + 3x - 1$

68. $f(x) = x + 2,\quad g(x) = x^4 + x^2 - 4$

69. $f(x) = \sqrt{x - 1},\quad g(x) = 3x$

70. $f(x) = \sqrt{x - 2},\quad g(x) = 2x$

71. $f(x) = \frac{2}{x},\quad g(x) = x + 1$

72. $f(x) = \frac{4}{x},\quad g(x) = x + 4$

65. a. $f \circ g(x) = f(g(x)) = f(x+3) = \sqrt{x+3}$

The numbers you are allowed to plug in (domain) are the ones where you're not taking the square root of a negative number, so you need to solve:

$x+3 \geq 0$ so $x \geq -3$ and the domain is $[-3,\infty)$

b. $g \circ f(x) = g(f(x)) = g(\sqrt{x}) = \sqrt{x} + 3$

The domain is $[0,\infty)$

67. a. $f \circ g(x) = f(g(x)) = f(x^2+3x-1) = \left(x^2+3x-1\right)^3$, which has domain $(-\infty,\infty)$

b. $g \circ f(x) = g(f(x)) = g(x^3) = \left(x^3\right)^2 + 3x^3 - 1$, which also has domain $(-\infty,\infty)$

71. a. $f \circ g(x) = f(g(x)) = f(x+1) = \dfrac{2}{x+1}$

The domain (allowed numbers for x) is everything that does not have 0 in the denominator, so everywhere except $x = -1$. In interval notation, the domain is $(-\infty,-1) \cup (-1,\infty)$

$$g \circ f(x) = g(f(x)) = g\left(\frac{2}{x}\right) = \frac{2}{x} + 1$$

The domain (allowed numbers for x) is everything that does not have 0 in the denominator, so everywhere except $x = 0$. In interval notation, the domain is $(-\infty,0) \cup (0,\infty)$