Function Homework

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Exercises for Section 17.1

1. domain = {0,1,2, 3, 4}, range = {2,3,4}, f(2) = 4, f(1) = 3
2. domain = A, range = 2,3,4,5, f(b) = 3, f(d) = 5
3. {(a,0), (b, 0)}, {(a, 0), (b,1)}, {(a,1), (b,1)}, {(a,1), (b,0)}
4. {(a,0), (b, 0), (c,0)}, {(a, 0), (b,1), (c, 0)}, {(a,0), (b,1), (c,1)}, {(a,0), (b,0), (c,0)}, {(a,1), (b,0), (c, 0)}, {(a,1), (b, 1), (c,0)}, {(a, 1), (b, 0), (c,1)}, {(a, 1), (b,1), (c,1)}
5. (a, d)

Exercises for Section 17.2

1.
2.

5

6

7

9

15

16

17

1.
2.
3.
4.
5.
6.
7.

Exercises for Section 17.4

1. (5,1), (6,1), (8,1)

3 $g \circ f = (1,1), (2,1), (3,3)$
$f \circ g = (1,1), (2,2), (3,2)$

5 $g(f(x)) = x + 1$
$f(g(x)) = \sqrt[3]{x^3 + 1}$

6 $g(f(x)) = 3(\frac{1}{x^2+1}) + 1$
$f(g(x)) = \frac{1}{(3x+2)^2+1}$

7 $g \circ f = (mn + 1, mn + m^2)$
$f \circ g = ((m + 1)(m + n), (m + 1)^2)$

8 $g \circ f = (5(3m - 4n) + 2m + n, 3m - 4n)$
$f \circ g = (3(5m + n) - 4m, 2(5m + n) + m)$

9 $g \circ f = (m + n, m + n)$
$f \circ g = m + m = 2m$

i

$$f \circ g \circ h = f(g(h(x)))$$
$$= (\frac{1}{(x^4)^2+1})^3 - 4(\frac{1}{(x^4)^2+1})$$

ii

$$f \circ h \circ g = f(h(g(x)))$$
$$= ((\frac{1}{x^2+1})^4)^3 - 4((\frac{1}{x^2+1})^4)$$

iii

$$h \circ g \circ f = h(g(f(x)))$$
$$(\frac{1}{(x^3-4x)^2+1})^4$$

Exercises for Section 17.5

1.

Injective
$f(a) - f(b) \neq 0$
$6 - a - 6 + b = -a + b \neq 0$
Therefore, it's Injective
Surjective
$f(a) = b$
$6 - a = b$
$a = -b + 6$
$-b + 6 \in \mathbb{Z}$
Therefore, it's Surjective
Therefore, it's Bijective
Inverse
$m = 6 - n$
$m - 6 = -n$
$-m + 6 = n$
$f^{-1}(n) = -n + 6$

2.

$$y = \frac{5x+1}{x-2}$$
$$y(x-2) = 5x+1$$
$$yx - 2y = 5x+1$$
$$yx - 5x = 1+2y$$
$$x(y-5) = 1+2y$$
$$x = \frac{1+2y}{y-5} f^{-1}(x) = \frac{1+2x}{x-5}$$

3.

Injective
$$f(a) - f(b) \neq 0$$
$$2^a - 2^b \neq 0$$
Therefore, it's Injective
Surjective
$$f(a) = b$$
$$2^a = b$$
$$a = log_2(b)$$
$$b \in B$$
Therefore, it's Surjective
Therefore, it's Bijective
Inverse
$$f^{-1}(n) = log_2(n)$$

5

$$y = \pi x - e$$
$$y + e = \pi x$$
$$\frac{y+e}{\pi} = x$$
$$f^{-1}(x) = \frac{x+e}{\pi}$$