Homework 4

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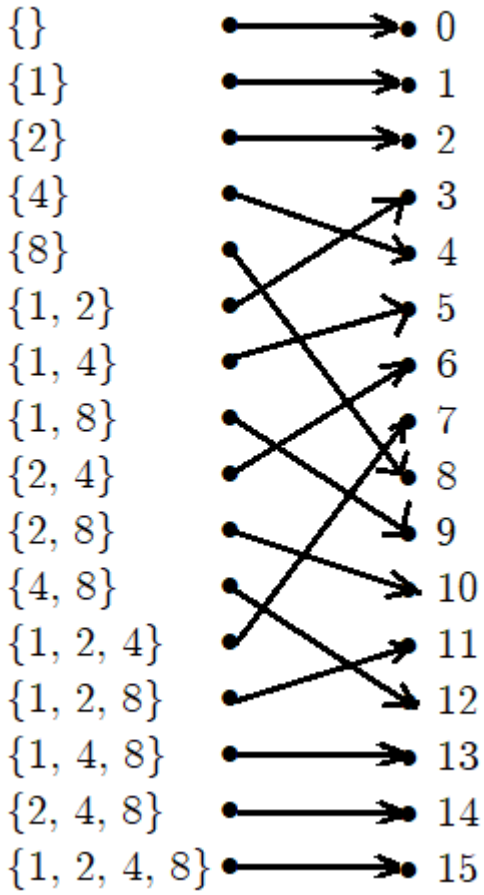
Section 4.1 (p266)

1. Exercise 9.c



2. Exercise 13

(a).

3. Exercise 18.b

The inverse function $f^{-1}(x) = g(x) = \frac{x}{3} - \frac{5}{3}$.

Proof: let an element $x \in \mathbb{R}$ be given.

$$\begin{aligned} g(f(x)) &= g(3x+5) \\ &= \frac{3x+5}{3} - \frac{5}{3} \\ &= x - \frac{5}{3} + \frac{5}{3} \\ &= x \end{aligned}$$

By definition of an inverse function, $g(x)$ is the inverse of $f(x)$.

4. For each of the following Java methods, state whether or not it meets the definition of a function with domain and codomain `Color`. If not, state the reason why.

Part (a)

Yes.

Part (b)

No. Colors with `red` values different than `green` values is not covered by the output, since the outputting colors always have the same `red` and `green` values.

Part (c)

Yes.

5. Implement a method that is the inverse of the *grayscale* method above, i.e. *grayscale*$^{-1}$, or state why *grayscale* is not invertible:

This function is not invertible because its input space is bigger than its output space, meaning that the function is not one-to-one. The input space is all colors with RGB values that can each be distinct, whereas the function only outputs colors with the same values for RGB.

Section 4.2 (p277)

1. Exercise 2.a

2. Exercise 4

3. Exercise 23

4. Implement a method that is the *grayscale* method composed with the negative method, i.e. *grayscale* $\circ$ *negative*, or state why it is not possible.

Section 4.3 (p298)

5. Exercise 4.b

6. Exercise 9

7. Exercise 13

8. Exercise 20

Part (a)

Part (b)

Part (c)

Part (d)

Section 4.4 (p311)

1. Exercise 6

Part (a)

Part (b)

Part (c)

Part (d)

2. Exercise 14

Part (a)

Part (b)

Part (c)

Part (d)

3. Exercise 18

Part (a)

Part (b)

Part (c)

Part (d)

4. Exercise 22

Section 4.5 (p322)

5. Exercise 9.b

6. Exercise 11

7. Exercise 21