

# CISC 2210 Discrete Structures - Noson S. Yanofsky

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## 1.7

### 1.

Let  $S = \{1, 2, 3, 4, 5\}$  and  $T = \{a, b, c, d\}$ . For each question below: if the answer is Yes, give an example, else explain briefly.

Figure 1 ►

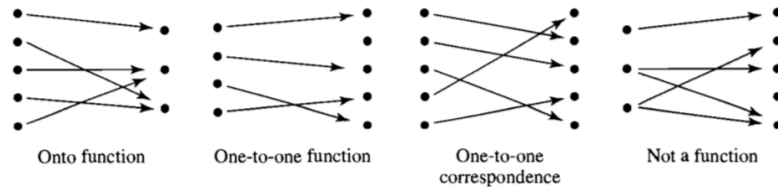


Figure 1: types of functions

*onto: every element in codomain is accounted for*

*one-to-one: every element in domain has a unique spot in codomain*

*one-to-one correspondence: one-to-one between domain-codomain and codomain-domain*

(a)

Are there any one-to-one functions from  $S$  into  $T$ ?

No, this would be an onto function but doesn't meet the requirements for one-to-one.

(b)

Are there any one-to-one functions from  $T$  into  $S$ ?

Yes. One element in  $S$  will be unused.

(c)

Are there any functions mapping  $S$  onto  $T$ ?

Yes. Some two elements from  $S$  will map onto some single element in  $T$ .

(d)

Are there any functions mapping  $T$  onto  $S$ ?

No, not enough elements in  $T$  to fill up codomain  $S$ . This could be a one-to-one however.

(e)

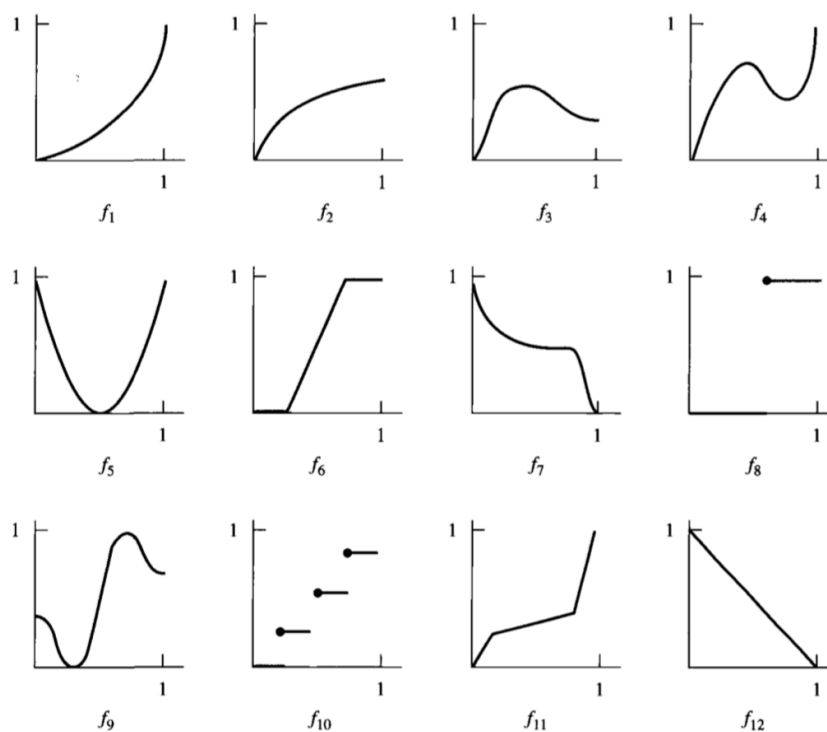
Are there any one-to-one correspondences between  $S$  and  $T$ ?

No,  $S$  and  $T$  have different number of elements.

2.

The functions sketched in Figure 3 have domain and codomain both equal to  $[0, 1]$

**Figure 3** ►



*(TODO check with Professor about question 2)*

(a)

Which of these functions are one-to-one?

$f_1, f_2, f_{11}$  because  $x$  and  $y$  coordinates are not repeated on  $x$  and  $y$  axes.

**(b)**

Which of these functions map  $[0, 1]$  onto  $[0, 1]$ ?

Might be a bit of a trick question; the original statement tells us that all functions have domain and codomain mapped to  $[0, 1]$ .

**(c)**

Which of these functions are one-to-one correspondences?

$f_{12}$  because the graph is symmetrical diagonally with no repeated points on  $x$  and  $y$  axes.

**3.**

**(a)**