

### §3.1 Homework Solutions

1) a) [BB] b) No as  $f(3)$  is not assigned. c) [BB]

d) No,  $f(1)$  is multiply assigned and  $f(2), f(3), f(4)$  are not.

e) Yes (in fact  $f$  is a bijection, see §3.2).

3) [BB]

13) a) [BB] b) Not one-to-one since eg  $\text{mult}(1,4) = \text{mult}(2,2)$   
It is onto since  $\forall y \in \mathbb{R}, \text{mult}(1,y) = y$ .

15) a) [BB] b)  $f$  is one-to-one on  $\mathbb{N}$  because  
 $f(x_1) = f(x_2) \Rightarrow 3x_1 + 5 = 3x_2 + 5 \Rightarrow 3x_1 = 3x_2 \Rightarrow x_1 = x_2$

However  $f$  is not onto on  $\mathbb{N}$  because no integer maps onto eg 1.

25) a) It is not one-to-one (injective) since  $f(a) = f(d) = a$   
Restricting  $f$  to either  $\{a, b, c\}$  or  $\{b, c, d\}$  makes it injective.

b) [BB]

c)  $\sin x$  oscillates between  $-1$  and  $+1$  and in particular  $\sin x = \sin(x + 2\pi) \forall x$

If we restrict  $\sin x$  to  $[-\frac{\pi}{2}, \frac{\pi}{2}]$  then we get

This new function is bijective if  $\sin x: [-\frac{\pi}{2}, \frac{\pi}{2}] \rightarrow [-1, 1]$   
(and hence has an inverse from §3.2).

