a) Injective and Non-Surjective
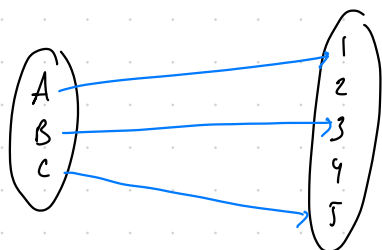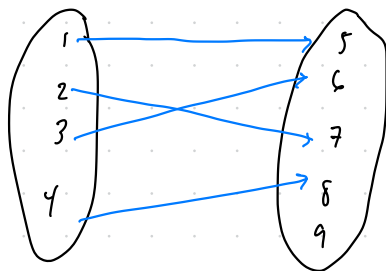
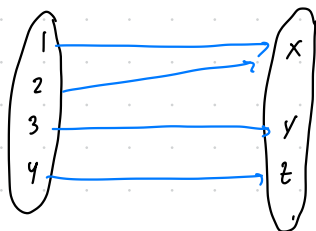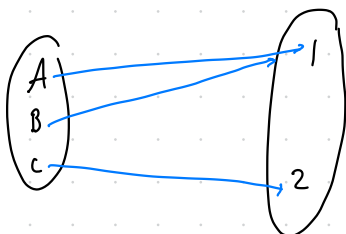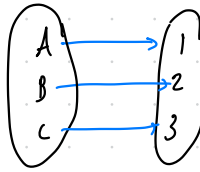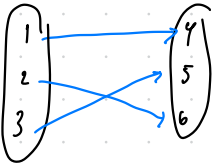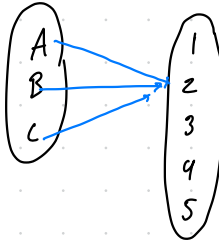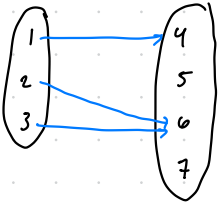b) Surjective and Non-injective
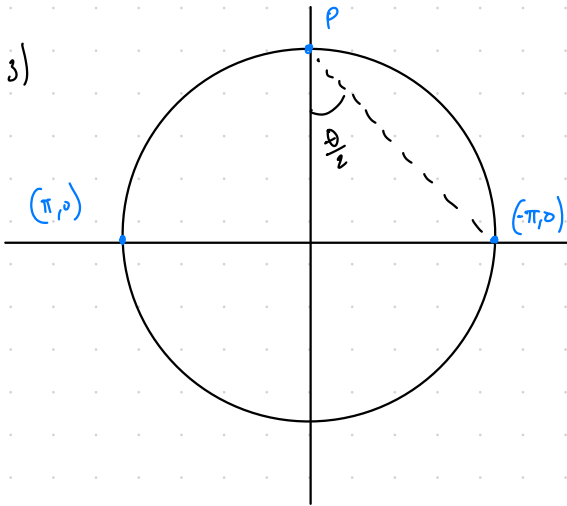
c) Bijective

d) Non-surjective and Non-injective

3)

$y - 1 = mx$

$m = \dfrac{\sin\theta - 1}{\cos\theta}$

Line equation: $\quad y - 1 = \dfrac{\sin\theta - 1}{\cos\theta}\, x$

For $y = 0$

$$-1 = \dfrac{\sin\theta - 1}{\cos\theta}\, x$$

$$\Rightarrow \quad x = \dfrac{\cos\theta}{1 - \sin\theta}$$

$$\Rightarrow \quad S = \dfrac{\cos\theta}{1 - \sin\theta}$$