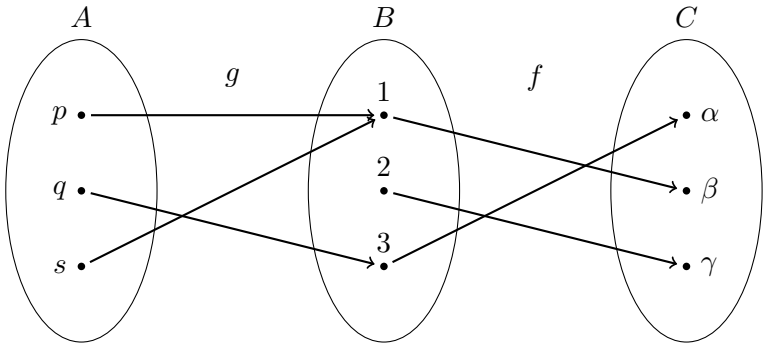
COMP S264F Discrete Mathematics
Tutorial 6: Functions (1)

Question 1. Consider the following arrow diagram for the functions f and g.



(a) Write the domains, codomains and ranges of f, g and $f \circ g$.

(b) Find $f(2)$.

(c) Find $(f \circ g)(s)$.

(d) Assume $(f \circ g)(x) = \beta$. List the possible value(s) of x.

Question 2. Assume f is a bijective function and its domain is the set of non-zero real numbers. Its codomain is the range of f. Find the *inverse* of the followings.

(a) $f(x) = 4x + 2$

(b) $f(x) = 3 + \dfrac{1}{x}$

Question 3. Consider the following functions with both domain and codomain $= \mathbb{R}$.

- $f(x) = 3x + 1$
- $g(x) = \dfrac{x}{2}$

Find the followings.

(a) $(f \circ g)(x)$

(b) $(g \circ f)(x)$

Question 4. Determine whether each of the following functions is *injective*, *surjective* and *bijective* with proof.

(a) $f : \mathbb{Z} \to \mathbb{Z}$ such that $f(x) = -x$

(b) $f : \mathbb{R} \to \mathbb{R}$ such that $f(x) = |x|$

(c) $f : \mathbb{Z} \to \mathbb{Z}$ such that $f(x) = 6x - 9$

(d) $f : \mathbb{R} \to \mathbb{R}$ such that $f(x) = 2x^3 - 4$

Question 5. Consider the functions $g : A \to B$ and $f : B \to C$. Prove or disprove the following statements.

(a) If g is injective, then $f \circ g$ is injective.

(b) If $f \circ g$ is injective, then g is injective.

(c) If f and g is surjective, then $f \circ g$ is surjective.