

Quiz #8, Due: 10/26
Math 181 (Discrete Structures), Fall 2022

Problem 1 is worth 3 points (1 pt each part), Problem 2 is worth 3 points, and Problem 3 is worth 4 points (1 pt each part), for a total of 10 points. Remember to *show your work* and *explain your answers* on all problems!

1. Let $X = \{1, 2, 3\}$ and $Y = \{w, x, y, z\}$. For each of the following subsets of $X \times Y$, does it correspond to a function $f: X \rightarrow Y$? Explain.
 - (a) $\{(3, w), (1, w), (2, y)\}$
 - (b) $\{(1, w), (2, x), (3, z), (1, x)\}$
 - (c) $\{(1, w), (3, y)\}$
2. Let $X = \{0, 1, 2, 3, 4, 5\}$. Let $f: X \rightarrow X$ be defined by $f(x) = 4x \bmod 6$ for all $x \in X$. Draw the arrow diagram of the function f . Is f one-to-one? Is f onto? Explain.
3. Let $f: \mathbb{Z} \rightarrow \mathbb{Z}$ and $g: \mathbb{Z} \rightarrow \mathbb{Z}$ be defined by

$$f(n) = 2n + 1, \qquad g(n) = 3n - 1,$$

for all $n \in \mathbb{Z}$. Write the formulas defining each of the following functions from \mathbb{Z} to \mathbb{Z} , which are various compositions of f and g .

- (a) $f \circ f$
- (b) $f \circ g$
- (c) $g \circ f$
- (d) $g \circ g$