Skill Mastery Quiz 11

Communicating in Math (MTH 210-01)
Winter 2020

Name:

S3-3 Let $f : \mathbb{Z} \to \mathbb{Z}$ be defined by $f(m) = m + 3$.

1. State the domain, codomain, and range of f. (Clearly state which one is which.) The domain is $\mathbb{Z}$ and the codomain is $\mathbb{Z}$, note these are both given in the definition of the function. The range in this case is also $\mathbb{Z}$ since the outputs will be $\{\dots, -1+3, 0+3, 1+3, 2+3, \dots\} = \{\dots, 2, 3, 4, 5, \dots\}$.

2. Find the image(s) of -1 under f. Since $f(-1) = -1 + 3 = 2$, so the image of -1 under f is 2

3. Find the preimage(s) of 4. Solve $f(x) = 4$ and take the ones that are in the domain. In this case $4 = m + 3$ gives only one preimage, 1.

S4-2 Let A and B be sets. Carefully complete the definitions of the following terms. (Note: "no collisions" and "range=codomain" are helpful ways to think about these, but they are NOT the definitions.)

1. A function $f : A \to B$ is injective provided that... for all $x, y \in A$ if $x \neq y$ then $f(x) \neq f(y)$

2. A function $f : A \to B$ is surjective provided that... for all $y \in B$, there exists $x \in A$ such that $f(x) = y$

3. A function $f : A \to B$ is bijective provided that... f is both injective and surjective

S6-2 Let $x, y \in \mathbb{Z}$ and $n \in \mathbb{N}$. State the definitions of the following:

1. $x \mid y$ (for nonzero r) there exists an integer k such that $xk = y$.

2. $x \equiv y \pmod{n}$. $n \mid x - y$

Give an example of integers x and y such that $x \nmid y$ and $y < 0$. $x = 10$ and $y = -3$ then for all integers k, $10k \neq -3$. There are lots of answers to this question though!

S5-1 For all $a, b \in \mathbb{Z}$ say $a \sim b$ if and only if $a \mid b$. Is $\sim$ an equivalence relation? Explain. This is not an equivalence relation. To justify you only have to explain one of not being reflexive or not being symmetric. This relation is not symmetric since $0 \in \mathbb{Z}$ and $0 \nmid 0$. It is also not symmetric since, for example, $2, 6 \in \mathbb{Z}$ and $2 \mid 6$, but $6 \nmid 2$.