MAT2362 Minitest #5. Due Oct. 29 before class.

Name:

Student Number: .....

1. Let $f : \mathbb{Z} \to \mathbb{Z}$ be the function $f(x) = x^2$. Which of the following is true?

A. f is bijective
B. f is injective but not surjective
C. f is surjective but not injective
D. f is neither injective nor surjective

Answer: .....

2. True or False? The empty relation from $\emptyset$ to $\mathbb{R}$ is functional.

Answer: .....

3. Let $A = \{x \in \mathbb{R} \mid x > 0\}$ and consider the function $g : A \to A$ defined by $g(x) = \frac{1}{x}$. Which of the following is true?

A. g is bijective.
B. g is injective but not surjective.
C. g is surjective but not injective.
D. g is neither injective nor surjective.
E. g is not a well-defined function.

Answer: .....

4. True or False? If $f : A \to B$ and $g : B \to C$ are functions and $g \circ f : A \to C$ is surjective, then g is surjective.

Answer: .....

5. Give an example of a function $h : \mathbb{N} \to \mathbb{N}$ that is surjective but not injective.

Answer: .....

6. Let $R \subseteq \mathbb{Q} \times \mathbb{Q}$ be the relation defined by

$$R = \{(x, y) \mid x = y^3\}.$$

Which of the following is true?

A. R is functional.
B. R is single-valued but not total.
C. R is total but not single-valued.
D. R is neither single-valued nor total.
E. R is not a well-defined relation.

Answer: .....

7. Which of the following are true for all sets A, B, C? (Select all that apply.)

A. $A \times A \cong A$
B. $A \times (B \times C) \cong (A \times C) \times B$
C. $A + B = B + A$
D. $\mathcal{P}(A + B) \cong \mathcal{P}(A) + \mathcal{P}(B)$

Answer(s): .....

8. True or False? If the characteristic function of a subset $A \subseteq X$ is not surjective then $A = X$ or $A = \emptyset$.

Answer: .....

9. Give an example of a set A and a set B such that the maximal relation from A to B is functional.

Answer: .....

10. Let $A = \{0, 1\}$, $B = \emptyset$, and $C = \{a, b, c\}$. Calculate

(a) The number of functions from A to B.

Answer: .....

(b) The number of functions from C to A

Answer: .....