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**MATH 2800–80 - Fall 2025 - Assignment 07 - Due 11/25/2025 at 11:59PM**

**Instructions:** Please follow the rules stated in the syllabus. Submit only one pdf file to WyoCourses.  
Start every problem below on a new page and use the following format.

**Result.** Write the statement you want to proof.

**Proof.** Compose the proof. At its completion, end it with the box (see the image at the right end corner).



1. A function  $f : \mathbb{Z} \rightarrow \mathbb{Z}$  is defined by  $f(n) = 5n + 2$ . Determine whether  $f$  is (a) injective, (b) surjective.
2. Prove that the function  $f : \mathbb{R} - \{2\} \rightarrow \mathbb{R} - \{5\}$  defined by  $f(x) = \frac{5x+1}{x-2}$  is bijective.
3. Let  $A$  be a nonempty set and let  $f : A \rightarrow A$  be a function. Prove that if  $f \circ f = i_A$ , then  $f$  is bijective.
4. The composition  $g \circ f : (0, 1) \rightarrow \mathbb{R}$  of two functions  $f$  and  $g$  is given by  $(g \circ f)(x) = \frac{4x-1}{2\sqrt{x-x^2}}$  where  $f : (0, 1) \rightarrow (-1, 1)$  is defined by  $f(x) = 2x - 1$  for  $x \in (0, 1)$ . Determine the function  $g$ .
5. Let  $A = \mathbb{R} - \{1\}$  and define  $f : A \rightarrow A$  by  $f(x) = \frac{x}{x-1}$  for all  $x \in A$ . (a) Prove that  $f$  is bijective. (b) Determine  $f^{-1}$ , i.e., the inverse function of  $f$ .
6. Prove that  $\left\{ \frac{n+2}{2n+3} \right\}$  is convergent to  $\frac{1}{2}$ .
7. Give an  $\epsilon - \delta$  proof that  $\lim_{x \rightarrow 3} \frac{3x+1}{4x+3} = \frac{2}{3}$ .