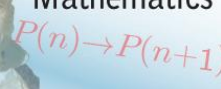


 $\phi: G \rightarrow H$
Algebra I**HW1**

(Due 5:00 pm, Wednesday, February 11, 2026 on *WyoCourses*)

Instructions: See the syllabus for general instructions for completing homework. Further details are found at the FAQ page linked from the syllabus. Always check your answers wherever feasible. Write clearly, using correct notation.

- (8 points) Let G be the symmetry group of the letter **S** (using the Computer Modern Sans Serif font!)
 - What is the order of G ?
 - Is G abelian?
 - How many rotational symmetries does G have?
 - How many reflectional symmetries does G have?
- (8 points) Repeat #1 with the letter **X**.
- (8 points) Repeat #1 with the letter **W**.
- (8 points) Repeat #1 with the letter **R**.
- (20 points) Consider a multiplicative group $G = \{a, b, c, d, e\}$ in which $ba = a$, $a^2 = c$, and $c^2 = d$.
 - Complete a Cayley table (i.e. multiplication table) of G , using the information given.
 - How many elements of each order does G have?
 - Is G abelian?
- (25 points) The multiplicative group $G = SL_2(\mathbb{R})$ consists of all matrices $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ with $a, b, c, d \in \mathbb{R}$ such that $ad - bc = 1$. Note that the element $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \in G$ has infinite order.
 - Find an element of order 2 in G .
 - Is the answer in (a) unique? Explain.
 - Find an element of order 3 in G .
 - Is the answer in (c) unique? Explain.
 - Find an element of infinite order in G .