Math 235 - Dr. Miller - HW #8: Relation Properties - **Due Friday, Nov. 1, 2024, by 4pm**

1. Define a relation S on $\mathbf{R} \setminus \{0\}$ by xSy if $xy = 1$.
   (a) Explore the relation by completing these ordered pairs that belong to S: $(3, \_\_)$, $(-1/2, \_\_)$, $(\pi, \_\_)$.
   (b) Determine whether S is reflexive, symmetric, transitive, and formally prove each of your claims.

2. Define a relation M on $\mathbf{Z} \times \mathbf{Z}$ via $(a, b)M(x, y)$ if $a = x$ or $b = y$.
   (a) Explore the relation by finding 3 ordered pairs that are related to $(5, -2)$, and three that are related to $(-4, -4)$.
   (b) Determine whether M is reflexive, symmetric, transitive, and formally prove each of your claims.

3. Define a relation T on $\mathbf{Z}$ via xTy if $3|2x + y$.
   (a) Explore the relation by finding 3 integers that satisfy $5Ty$ and another 3 integers that satisfy $xT0$.
   (b) Determine whether T is reflexive, symmetric, transitive, and formally prove each of your claims.

4. Define a relation P on $\mathbf{R}$ via xPy if $|x| \cdot y = x \cdot |y|$.
   (a) Explore the relation by finding all real numbers that satisfy $(-5)Py$ and all that satisfy $xP\pi$.
   (b) Determine whether P is reflexive, symmetric, transitive, and formally prove each of your claims.

5. Define a relation E on $\mathbf{R}^+ \times \mathbf{R}^+$ via $(a, b)E(c, d)$ if $ad = bc$.
   (a) Explore the relation by finding 3 ordered pairs that satisfy $(-5, 2)E(x, y)$ and three that satisfy $(x, y)P(2, 1)$.
   (b) Determine whether E is reflexive, symmetric, transitive, and formally prove each of your claims.