

**Assignment 3**

This assignment is due on Tuesday February 12th at the beginning of class. You may either handwrite this assignment or typeset it using  $\text{\LaTeX}$ ; either way please submit a .pdf file through UTORsubmit. Please also submit a hard copy in class.

1. Consider the relation on  $A = \mathbb{R} \times \mathbb{R} \setminus \{(0, 0)\}$  given by  $(x, y) \sim (z, w) \iff xw = yz$ .
  - a) Show that  $\sim$  is an equivalence relation.
  - b) Describe the set of equivalence classes  $A/\sim$ .
  - c) Which of the following are well-defined functions on  $A/\sim$ ?
    - i.

$$f : A/\sim \rightarrow A/\sim \\ [(x, y)] \mapsto \left[ \left( \frac{x}{4}, 3y \right) \right]$$

ii.

$$g : A/\sim \rightarrow \mathbb{R} \\ [(x, y)] \mapsto \frac{x}{y}$$

iii.

$$h : A/\sim \rightarrow \mathbb{R} \times \mathbb{R} \\ [(x, y)] \mapsto \left( \frac{x}{\sqrt{x^2 + y^2}}, \frac{y}{\sqrt{x^2 + y^2}} \right)$$

iv.

$$j : A/\sim \rightarrow A/\sim \\ [(x, y)] \mapsto [(x + 1, y - 1)]$$

2. Write a reflection on the process of writing your first draft of Essay 1.

- What did you enjoy?
- What did you find challenging?
- Were there any surprises?
- Is there anything you plan to do differently for Essay 2?