

# MAT1830 - Discrete Mathematics for Computer Science

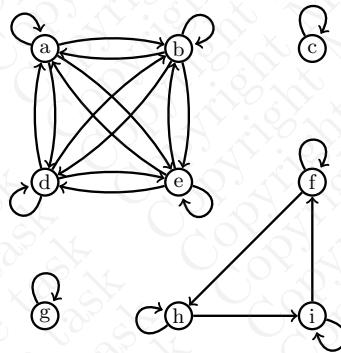
## Assignment #3

Submit by uploading a pdf to moodle by 11:55pm Wednesday in week 8

Assessment questions/solutions for this unit must not be posted on any website.

For Question 1, each 'no' needs an accompanying example. For Question 2, full justifications are required.

- (1) Let  $E$  be the binary relation on the set  $\{a, b, c, d, e, f, g, h, i\}$  pictured below. Write down whether  $E$  is reflexive, symmetric, antisymmetric, transitive. When  $E$  does not have one of these properties give an example of why not.



[Each 'no' needs an accompanying example.] [4]

- (2) Let  $R$  be a binary relation on  $\mathcal{P}(\{1, \dots, 50\}) - \{\emptyset\}$  defined by  $XRY$  if and only if  $\text{sum}(X) \leq \text{sum}(Y)$ , where  $\text{sum}(X)$  is the sum of the elements of  $X$  and  $\text{sum}(Y)$  is the sum of the elements of  $Y$ .

Is  $R$  reflexive? Is  $R$  symmetric? Is  $R$  antisymmetric? Is  $R$  transitive?

[Fully justify each answer.] [8]

- (3) Let  $S$  be the equivalence relation on  $\{-1, 0, 1\} \times \{0, 1, 2, 3\}$  defined by  $(a, b)S(c, d)$  if and only if  $a^2 + b = c^2 + d$ . Write down the equivalence classes of  $S$ .

[Answer only required.] [4]

- (4) State how many possible partial order relations  $U$  there are on the set  $\{a, b, c, d\}$  such that

- $bUa, cUa, dUa$ ; and
- $b \not U c, c \not U b, d \not U b$  and  $d \not U c$ .

Draw a Hasse diagram for each possible relation.

[Answer only required.] [4]