MA0301
ELEMENTARY DISCRETE MATHEMATICS
NTNU, SPRING 2019

Exercise Set 2

Exercise 1. (Grimaldi, 5. ed., Exercises 2.3) *Exercise 1: b)*

Exercise 2. (Grimaldi, 5. ed., Exercises 2.3) *Exercise 2: d)*

Exercise 3. (Grimaldi, 5. ed., Exercises 2.3) *Exercise 10: c), f)*

Exercise 4. (Grimaldi, 5. ed., Exercises 2.3) *Exercise 13: a), b) iii), v)*

Exercise 5. (Grimaldi, 5. ed., Exercises 2.4) *Exercise 8: a), c), h)*

Exercise 6. (Grimaldi, 5. ed., Exercises 2.4) *Exercise 12: a) i), v), viii)*

Exercise 7. (Grimaldi, 5. ed., Exercises 2.5) *Exercise 9*

Exercise 8. (Grimaldi, 5. ed., Exercises 2.5) *Exercise 10*

⋆ **Exercise 9.** *Translate the following expressions into English and Norwegian and determine which of them are true statements (for numbers in $\mathbb{R}$):*

(1) $\forall x \exists y (x > y \to x > y^2)$
(2) $\forall x \forall y (x > y \to \exists z (x > z \wedge z > y)$
(3) $\exists x \forall y \exists z ((x + y)z = 1)$
(4) $\forall x (I(x) \to \exists y (I(y) \wedge (x < y)))$, $I(x)$: *x is an integer.*
(5) $\neg \exists x \forall y (I(y) \to x > y)$, $I(x)$: *x is an integer.*

Note. *For the following exercise, recall that a prime number is a positive integer divisible only by itself and 1.*

⋆ **Exercise 10.** *Translate the following phrases English into statements (for numbers in $\mathbb{R}$; use $I(x)$: x is an integer.):*

(1) *No integer is both even and odd.*
(2) *Not every real number is greater than an integer.*
(3) *There are infinitely many primes. (Hint: this is equivalent to saying that for every natural number there is a greater prime.)*
(4) *Every even integer greater than 2 is the sum of two primes. This is known as Goldbach's conjecture.*

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