EXAM 3 (duration: 40 minutes)

DatZ1143: Discrete mathematics for computing
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Name and surname:
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Questions

(There are 6 questions on 3 pages with total 10 points.)

1) In the following of statements, exactly three of them are *True* and three of them are *False*. Name the **True** statements. Your answer must point/show **exactly three True** statements. (2 points)

a. $x \in \{x\}$

b. $\{x\} \in \{x\}$

c. $\{x\} \subseteq \{x\}$

d. $\emptyset \in \{x\}$

e. $\emptyset \subset \{x\}$

f. $\{\} \in \{x\}$

2) Write down all subsets of the set $S = \{1, \{2, 3\}, 4\}$. (2 points)

3) Let A and B be the following sets:
$A = \{a \mid a$ is an odd integer between -10 and 10$\}$ and
$B = \{b \mid b$ is a positive integer less than 12$\}$.

3.a) List the members of the set $A - B$. (1 point)

3.b) List the members of the set $B - A$. (1 point)

4) The functions $f(a) = \left\lceil \frac{a}{5} \right\rceil$ and $g(a) = \left\lfloor \frac{a}{5} \right\rfloor$ are defined from integers to integers. Calculate the values of the following two summations. (1 point)

$f(-6) + f(-3) + f(0) + f(3) + f(6) =?$

$g(-6) + g(-3) + g(0) + g(3) + g(6) =?$

5) Let $f(x) = 3x - 1$ and $g(x) = 2x - 3$ be two functions from integers to integers. Calculate the values of $(f \circ g)(1)$ and $(g \circ f)(1)$. (1 point)

6) Let $h(x) = cx^2 - x - 1$ is a function from integers to integers.

6.a) Write a value of c such that $h(x)$ is not invertible. Explain your answer by giving an example. (1 point)

6.b) Write a value of c such that $h(x)$ is invertible. Then, for this value of "c", find $h^{-1}(2)$. (1 point)