Assignment 1: Due date: 11:00pm 20 February 2021

Please upload to Canvas "assignment 1 return". Make sure you upload it before deadline. The window will close after the deadline and you WILL NOT be able to submit it.

We DO NOT accept assignment return via email, late submission, because we grade it via Canvas. Please submit early.

Q1. (10%) Simplify $\frac{2\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}$ such that the denominator consists of an integer only.

Q2. (15%) $A = \{red, green, blue\}$, $B = \{red, yellow, orange\}$,

$C = \{red, orange, yellow, green, blue, purple\}$. Find the following:

a. (5%) $A \cup B$
b. (5%) $A \cap B$
c. (5%) $A^C \cap C$

Q3. (10%) Suppose $A = \{cow, horse\}$, $B = \{egg, juice\}$. $H = \{cat, dog, rabbit, mouse\}$, $F = \{dog, cow, duck, pig, rabbit\}$, $W = \{duck, rabbit, deer, frog, mouse\}$.

a. (5%) Find cartesian product: $A \times B$.

b. (5%) Use Venn diagram to illustrate $(H \cap F)^C \cap W$.

Q4. (10%) Answer the following questions:

a. (5%) Write the following sets in the set-builder form:

$$A = \{3,15,35,63,99,143,195,255\}$$

b. (5%) Find the set A, $A = \{x \in \boldsymbol{R} | x = x^2\}$.

Q5. (15%) Determine if the follow functions are injective, surjective, or bijective.

a. (5%) $f: R \to R, f(x) = x^2$
b. (5%) $f: N \to N, f(x) = x + 2$
c. (5%) $f: R \to R, f(x) = 2x - 3$

Q6. (20%)

a. (10%) $f(x) = 2x + 3, g(x) = -x^2 + 5$. Find $(g \circ f)(x)$.
b. (10%)$f(x) = \frac{3}{5}x + 4, g(x) = 2x^2 - 5x + 9$. Find $(f \circ g)\left(\frac{1}{2}\right)$.

Q7. (10%) Define $f, g: R \to R, f(x) = 3^x, g(x) = x^3$. Prove g is surjective and f is not surjective.

Q8. (10%) Use contrapositive proof to prove: If x and $y \in Z$, $x + y$ is even, then x and y have the same parity (either both are even, or both are odd).