CS 70 HW #1

1) a) https://www.eecs70.org/

b) i) Discussions Attendance / mini vitamins: 5%

Vitamins: 5%

HW: 20% (2 lowest dropped on discrete math and 2 in probability)

MT: 25%

Final: 45%

ii) Need to attend 13 section

iii) Homework released on Sunday

Due on Saturday 4pm

iv) HW: 2 lowest dropped on discrete math and 2 in probability

Vitamins: 2 lowest dropped on discrete math and 2 in probability

v) MT: 3/8/23 Wed 7-9 pm

Final: 5/11/23 Thurs 3-6 pm

2) a) Yes, students are allowed to work together as long as they mention their partners

b) Yes, students are encouraged to do so

c) No, using websites not allowed

d) No, copying is not allowed

e) No, this whole situation is bad. No sending posts

f) No, looking at that isn't allowed

3) a) Students are encouraged to use Ed however to use it as a platform to ask informative questions to get to the answer. That particular format doesn't encourage learning rather wanting a simple answer

b) Weekly post every Sunday and required to read

4) I pledge to uphold the university's honor code: to act with honesty, integrity, and respect for others, including their work. By signing, I ensure that all written homework I submit will be in my own words, that I will acknowledge any collaboration or help received, and that I will neither give nor receive help on any examinations.

X

5) a) Let p(x) only equal to x^2. Then (x is 4) and when $p(x) = 0$ and if there is any other solution y, then $y = x$

↳ $\exists x \in \mathbb{R}\, (p(x) = 0) \wedge (\forall y \in \mathbb{R})\left[(p(y) = 0) \rightarrow (x = y)\right]$

b) $\forall x, y \in \mathbb{R}\, (x \neq y) \Rightarrow [\exists z \in \mathbb{Q}, (x < z < y) \vee (y < z < x)$

c) $(\forall x \in \mathbb{Z})((x^2 > 4) \Rightarrow (x > 2) \vee (x < -2))$

d) All real numbers are complex numbers

e) x and y are all integers that when squared and added to eachother cannot equal 10.

f) If a natural number is larger than 1, it can be written as the sum of 2 other natural numbers divided by two

b) a) True, in this situation there exist can be satisfied if they are adjacent; $\exists x, \exists y$ and $\exists y, \exists x$ mean there is a x and y in the universe

$T \to F \exists F$

b) False,

Assume $Q(x,y)$ as $x < y$; x and y integers in the universe

L) Consequence $T \to F$

c) True, there exists an x where x is true, consider x' for the p statement. The q statement has the same $x = x'$ and the statement is true for every y.

d) False

Assume $Q(x,y)$ as $x > y$

The first side can be shown by $x = 3$ $y = 2$

The second part can be false by $x = 3$ $y = 1$

$x = 3$ $y = 4$

L) $T \to F = \underline{F}$

1) a) $\forall x \exists y (P(x) \Rightarrow Q(x,y)) \stackrel{?}{\equiv} \forall x (P(x) \Rightarrow \exists y Q(x,y))$

Assume right side correct

* $\exists y$ means 1 specific solution for y

↳ $\forall x \underbrace{\exists y}(P(x) \Rightarrow Q(x,y))$

↳ $\forall x (P(x) \Rightarrow \exists y Q(x,y))$ → True

b) $\forall x ((\exists y\, Q(x,y)) \Rightarrow P(x)) \stackrel{?}{\equiv} \forall x \exists y (Q(x,y) \Rightarrow P(x))$

Assume left side correct

↳ $\forall x \underbrace{\exists y} (Q(x,y)) \Rightarrow P(x))$

* $\exists y$ means 1 specific solution for y

↳ $\forall x ((\exists y\, Q(x,y)) \Rightarrow P(x))$ → True

c) $\neg \exists x \forall y (P(x,y) \Rightarrow \neg Q(x,y)) \equiv \forall x ((\exists y\, P(x,y)) \land (\exists y\, Q(x,y)))$

Assume right hand side correct

↳ $\neg(\exists x \forall y)$ → $\forall x \exists y$; $\exists y$ means 1 specific solution for y

↳ De Morgan's Law → False

↳ Left: There is 1 x for all of y

↳ Right: There is a y where there is all x which exists

8) a) $f^{-1}(A \cap B) = f^{-1}(A) \cap f^{-1}(B)$

$\hookrightarrow x \in f^{-1}(A \cap B)$

$\hookrightarrow f(x) \in A \cup B$

$(f(x) \in A) \wedge (f(x) \in B)$

$(x \in f^{-1}(A)) \wedge (x \in f^{-1}(B))$

$x \in f^{-1}(A) \cap f^{-1}(B)$

B) $f^{-1}(A \setminus B) = f^{-1}(A) \cup f^{-1}(B)$

$x \in f^{-1}(A \setminus B)$

$fx \in (A \setminus B)$

$\downarrow$

$(f(x) \in A) \wedge \neg (f(x) \in B)$

$(x \in f^{-1}(A)) \wedge \neg (x \in f(B))$

$x \in f^{-1}(A) \setminus f^{-1}(B)$

c) $f(A \cap B) \subseteq f(A) \cap f(B)$; example is not hold ?

$\hookrightarrow f^{-1}(A \cup B) \subseteq f^{-1}(A) \cap f^{-1}(B)$

$x \in f^{-1}(A) \wedge (x \in f^{-1}(B))$

$f(x) \in A \wedge (f(x) \in B)$

$\hookrightarrow f(x) \in A \cap B$

$\underline{x \in f^{-1}(A \cap B)}$

example not hold : $A > B$

d) $f(A \setminus B) \supseteq f(A) \setminus f(B)$; example is not hold

$\hookrightarrow f^{-1}(A \setminus B) \supseteq f^{-1}(A) \setminus f(B)$

$x \in f^{-1}(A \setminus B) \supseteq f^{-1}(A) \setminus f(B)$

$f(x) \in A \setminus B) \supseteq f^{-1}(A) \setminus f(B)$

$\hookrightarrow f(x) \in (A \setminus B)$

$\hookrightarrow \underline{x \in f^{-1}(A \setminus B)}$

example not hold : $\frac{A}{B}$