CS2022/MA2201
HW#1 SOLUTIONS

1. CONTRAPOSITIVE: "If I'm not in Discrete Math, then I'm not having fun."
CONVERSE: "If I'm in Discrete Math, then I'm having fun."

2. ***a*** true ***b*** false ***c*** true ***d*** true

3. ***a*** $T(Ben, \text{CS2022})$
b $(\forall x)F(x)$
c $(\forall x)F(x) \rightarrow B(x)$
d $(\forall y)C(y) \rightarrow \neg U(y)$
e $(\forall x)(\exists y)T(x,y)$
f $(\exists x)\big(A(x) \wedge (\forall y)\big(C(y) \rightarrow \neg T(x,y)\big)\big)$
g $(\forall x)\big(F(x) \wedge A(x)\big) \rightarrow (\exists y)\big(U(y) \wedge T(x,y)\big)$
h Maia is a first year student.
i Isaac is not taking any courses
j Some part time students are not first year students.
k Every student is taking CS2022.

4. The variables x are students in CS2022/MA2201, and
$C(x)$ – x cheats
$B(x)$ – x sits in the back row
The statements we assume to be true are $(\forall x)C(x) \rightarrow B(x)$ and $B(George)$. We cannot infer anything about *George*'s honesty. Each of the following two interpretations with a universe of discourse {*George, Jen*} is consistent with the given statements:

- $\{B(George), B(Jen), C(George), \neg C(Jen)\}$
- $\{B(George), B(Jen), \neg C(George), \neg C(Jen)\}$

In logic, we say that *George*'s honesty is independent of the two statements.

5. ***a*** $(\forall x)F(x, Fred)$
b $(\forall x)F(Evelyn, x)$
c $(\forall x)(\exists y)F(x,y)$
d $\neg(\exists x)(\forall y)F(x,y)$
e $(\forall y)(\exists x)F(x,y)$
f $\neg(\exists x)F(x, Fred) \wedge F(x, Jerry)$