PHIL 220g: Introduction to Logic
Practice Midterm

NAME: TA:

Instructions

Two of the given arguments are **propositionally valid** and two are **propositionally invalid**. For each given argument:

1. state it in **premise-conclusion form**
2. **translate** it into **propositional logic**
3. **determine** whether the argument is **valid** or **invalid**:
    - if **valid**, build a **proof** of the conclusion from its premises.
    - if **invalid**, give an **assignment** on which the premises are true and the conclusion false.

OVER PLEASE

A

If you tossed the coin and it landed heads, then it didn't land tails. You tossed the coin, but it landed tails. Therefore, the coin didn't land heads.

PREMISE-CONCLUSION FORM

1. If you tossed the coin and it landed heads, then it didn't land tails.
2. You tossed the coin, but it landed tails.
3. Your coin didn't land heads.

TRANSLATION INTO PROPOSITIONAL LOGIC

translation key

p: You tossed the coin
q: Your coin landed heads
r: Your coin landed tails

1. $(p \wedge q) \rightarrow \neg r$
2. $p \wedge r$
3. $\neg q$

VALIDITY

Here is a proof of the conclusion from the premises:

1	$(p \wedge q) \rightarrow \neg r$	assumption
2	$p \wedge r$	assumption
3	$\quad q$	assumption
4	$\quad p$	E$\wedge$, 2
5	$\quad p \wedge q$	I$\wedge$, 3, 4
6	$\quad \neg r$	E$\rightarrow$, 1, 5
7	$\quad r$	E$\wedge$, 2
8	$\quad \bot$	E$\neg$, 6, 7
9	$\neg q$	I$\neg$, 3–8

OVER PLEASE

B

The car will not start unless you turn the ignition and there is gas in the tank. There is gas in the tank. Therefore, the car will start if you turn the ignition.

PREMISE-CONCLUSION FORM

1. The car will not start unless you turn the ignition and there is gas in the tank.
2. There is gas in the tank.
3. The car will start if you turn the ignition.

TRANSLATION INTO PROPOSITIONAL LOGIC

translation key

p: The car will start.
q: You turn the ignition.
r: There is gas in the tank.

1. $\neg(q \wedge r) \rightarrow \neg p$
2. r
3. $q \rightarrow p$

VALIDITY

Here is an assignment on which the premises are true and the conclusion is false:

p	q	r	$\neg(q \wedge r) \rightarrow \neg p$	r	$q \rightarrow p$
F	T	T	T	T	F

OVER PLEASE

C

If the policy is sound, then inflation will fall. If inflation falls, then the economy will decelerate and unemployment might rise. Therefore, if the policy is sound, then unemployment might rise.

PREMISE-CONCLUSION FORM

1. If the policy is sound, then inflation will fall.
2. If inflation falls, then the economy will decelerate and unemployment might rise.
3. If the policy is sound, then unemployment might rise.

TRANSLATION INTO PROPOSITIONAL LOGIC

translation key

p: The policy is sound.
q: Inflation will fall.
r: The economy will decelerate.
s: Unemployment might rise.

1. $p \to q$
2. $q \to (r \wedge s)$
3. $p \to s$

VALIDITY

Here is a proof of the conclusion from the premises:

1	$p \to q$	assumption
2	$q \to (r \wedge s)$	assumption
3	$\quad p$	assumption
4	$\quad q$	E$\to$, 1
5	$\quad r \wedge s$	E$\to$, 2, 4
6	$\quad s$	E$\wedge$, 4
7	$p \to s$	I$\to$, 3–6

OVER PLEASE

D

If your argument is sound, then it is valid and its premises are true. Your argument is not sound. So, if your argument is valid, then its premises are not true.

PREMISE-CONCLUSION FORM

1. If your argument is sound, then it is valid and its premises are true.
2. Your argument is not sound.
3. If your argument is valid, then its premises are not true.

TRANSLATION INTO PROPOSITIONAL LOGIC

translation key

p: Your argument is sound.
q: Your argument is valid.
r: Your argument has true premises.

1. $p \to (q \wedge r)$
2. $\neg p$
3. $q \to \neg r$

VALIDITY

Here is an assignment on which the premises are true and the conclusion is false:

p	q	r	$p \to (q \wedge r)$	$\neg p$	$q \to \neg r$
F	T	T	T	T	F