Section 1 — math 3

Proposition statement ⇒ when we have only one value either (true) or (false) that is proposition

*which of the sentences are proposition?

1. miami is the capital of florida (Prop.)
2. 2+3=5 (Prop.)
3. 5+7=10 (Prop.)
4. 3+2 = (not Prop.)
5. 2+x=11 (not Prop.)
6. Answer the question. (not Prop.)

Symbols

① ¬, N (not)

② ∧ (and) ③ ∨ (or)

④ ∨ ⊕ (exclusive OR) ⑤ → (condition)

⑥ ↔ (Bi-Condition)

* let p, q, r be the proposition where;

p: you have flu.

q: you miss the final exam

r: you pass the course

• express each of these propositions as an english.

① p→q: if you have flu, you miss the final exam

② ¬q↔r: you don't miss the final exam iff you pass the course

③ q→¬r: if you miss the final exam, you don't pass the course

④ (p∧q)∨(¬q∧r): you have flu and you miss the final exam or you don't miss the final exam and you pass the course

* let p, q be the proposition where;

p: drive over 65 miles/hour

q: you get a speeding ticket

① you don't drive over 65 miles/hour (¬p)

② you drive over 65 miles/hour but you don't get a speeding ticket (p∧¬q)

③ you will get a speeding ticket if you drive 65 miles/hour (p→q)

truth table

① Not (¬)

p	¬p
T	F
F	T

② and (∧)

p	q	p∧q
T	T	T
T	F	F
F	T	F
F	F	F

③ or (∨)

p	q	p∨q
T	T	T
T	F	T
F	T	T
F	F	F

④ Xor (⊕)

p	q	p⊕q
T	T	F
T	F	T
F	T	T
F	F	F

⑤ condition (→)

p	q	p→q
T	T	T
T	F	F
F	T	T
F	F	T

⑥ Bi-Condition (↔)

p	q	p↔q
T	T	T
T	F	F
F	T	F
F	F	T

*Determine whether these Bi-condition.

① 2+2=4 iff 1+1=2
② 1+2=3 iff 2+3=4
③ 1+1=3 ⇔ monkey can fly
④ 0>1 ⇔ 2>1
⑤ if (1+1=2) then (2+2=5)
⑥ if (1+1=3) then (2+2=4)

T ⇔ T ≡ T
T ⇔ F ≡ F
F ⇔ F ≡ T
F ⇔ T ≡ T
T → F ≡ F
F → T ≡ T

*Show that each of the conditional statementes are equivalent by use truth table.

① $(P \wedge q) \rightarrow P$

P	q	$(P \wedge q)$	$(P \wedge q) \rightarrow P$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	T

② $\neg P \rightarrow (P \rightarrow q)$

P	q	$\neg P$	$(P \rightarrow q)$	$\neg P \rightarrow (P \rightarrow q)$
T	T	F	T	T
T	F	F	F	T
F	T	T	T	T
F	F	T	T	T

③ $\neg (P \rightarrow q) \rightarrow P$

P	q	$(P \rightarrow q)$	$\neg (P \rightarrow q)$	$[\neg (P \rightarrow q) \rightarrow P]$
T	T	T	F	T
T	F	F	T	T
F	T	T	F	T
F	F	T	F	T

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*Solve it

① $(P \vee q) \rightarrow (P \oplus q)$

P	q	$(P \vee q)$	$(P \oplus q)$	$[(P \vee q) \rightarrow (P \oplus q)]$
T	T	T	F	F
T	F	T	T	T
F	T	T	T	T
F	F	F	F	T

* $(p \leftrightarrow q) \oplus (\neg p \leftrightarrow \neg r)$

p	q	r	$p \leftrightarrow q$	$\neg p$	$\neg r$	$\neg p \leftrightarrow \neg r$	expression
T	T	T	T	F	F	T	F
T	T	F	T	F	T	T	F
T	F	T	F	F	F	T	T
T	F	F	F	F	T	T	T
F	T	T	T	T	F	F	T
F	T	F	T	T	T	T	F
F	F	T	T	T	F	F	T
F	F	F	T	T	T	T	F

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* $(p \leftrightarrow q) \leftrightarrow (r \leftrightarrow s)$

(p)	(q)	(r)	(s)	$(p \leftrightarrow q)$	$(r \leftrightarrow s)$	$(p \leftrightarrow q) \leftrightarrow (r \leftrightarrow s)$
T	T	T	T	T	T	T
T	T	T	F	T	F	F
T	T	F	T	T	F	F
T	T	F	F	T	T	T
T	F	T	T	F	T	F
T	F	T	F	F	F	T
T	F	F	T	F	F	T
T	F	F	F	F	T	F
F	T	T	T	F	T	F
F	T	T	F	F	F	T
F	T	F	T	F	F	T
F	T	F	F	F	T	F
F	F	T	T	T	T	T
F	F	T	F	T	F	F
F	F	F	T	T	F	F
F	F	F	F	T	T	T

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