Math 321

Exam 1 10 probs + 1 extra credit

1.1 (2 probs)

① Eng ⟷ symbols

ex. p: "blah" q: "bleck"

$(p \to q) \vee \neg p$ is a eng. sentence.

ex: Given a sentence you choose symbols & ops.

② truth table everyone should know.

1.2 (2 probs)

③ show $p \equiv q$ by a truth table

④ Use the logical equivalences

1.3, 1.4 ⑤ Eng ⟷ Sym.

1.5 (2 probs)

⑥ given premises state valid conclusion(s).

⑦ given the argument state the rules/fallacies

1.6
1.7

(8) direct proof & something
(9) contrapositive (→ turn into a cases)
(10) $\sqrt{2}$ is irrational

extra credit 1.5 (34 or 35)

Q's / #4: for the solns to $r^3+r+1=0$ none are rational.

pf: (contradiction) assum $r_1 = \frac{a}{b}$ is rational.

$$\left(\frac{a}{b}\right)^3 + \left(\frac{a}{b}\right) + 1 = 0$$

$$a^3 + ab^2 + b^3 = 0$$

if $a<0, b>0$ $\quad b^3 = |a|^3 + |a|b^2$

etc.

1.6(26) $n \in \mathbb{Z}^+$, n is even iff $7n+4$ is even.

pf: show $(p \leftrightarrow q) \equiv T$ or $p \to q \wedge q \to p$

$p \equiv r \equiv s \equiv t$

tech 1

tech 2

try tech1

n is even

$\equiv n = 2k$ for some $k = \{1, 2, 3, \ldots\}$

$\equiv 7(2k) + 4 = 14k + 4 = 2(7k + 2)$

$\equiv 7n + 4$ is an even.

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try tech2

$n = 2k \rightarrow 7n + 4 = 7(2k) + 4$

$= 14k + 4$

$= 2(7k + 2)$

So $7n + 4$ is even.

and

$7n + 4$ is even $\rightarrow$ n is even

$\equiv$ (n is odd) $\rightarrow$ ($7n + 4$ is odd)

$n = 2k + 1 \rightarrow 7(2k + 1) + 4$

$= 14k + 7 + 4$

$= 14k + 10 + 1$

$2(7k + 5) + 1$ is odd

Ex if $n \leq 2 \rightarrow (n+1)^2 \geq 3^n$

pf: case 1

$(n=1) \rightarrow (n+1)^2 \geq 3^n$

case 2

$(n=2) \rightarrow (n+1)^2 \geq 3^n$

test "like this"

Prove $(n+1)^2 < 3^n$ then $n > 2$