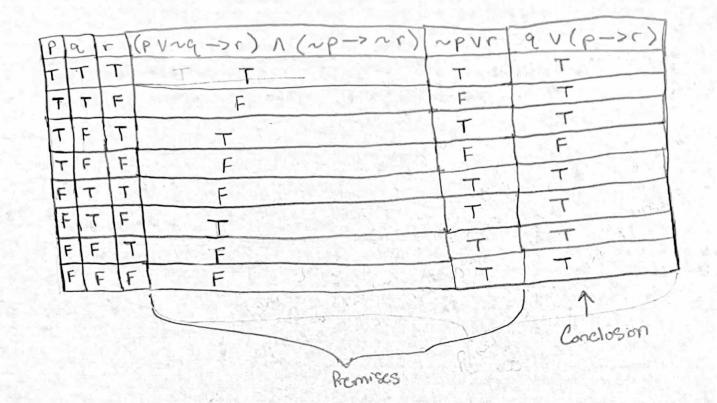CJ Hess

1a. The sentence $2-x = 6 + x$ is not a statement because it can be both true or false based on the value of x.

1b. $\sim(\forall$ real number x, if $x(x-2) > 0$ then $x > 2$ or $x < 0)$
$= \exists x$ real number x, if $x(x-2) <= 0$ then $x <= 2$ and $x >= 0$

1c. Inverse: For all integers n, if n is not prime then n is not odd.
Contrapositive: For all integers n, if n is not odd then n is not prime

1d. For all answers on problem 16, if the answer is not 10 then problem 16 is not correct.

1e. False

1f. True

1g. True

2.

p	q	r	(p∨~q→r) ∧ (~p→~r)	~p∨r	q∨(p→r)
T	T	T	T T	T	T
T	T	F	F	F	T
T	F	T	T	T	T
T	F	F	F	F	F
F	T	T	F	T	T
F	T	F	T	T	T
F	F	T	F	T	T
F	F	F	F	T	T

Premises ⟵ (columns 4 and 5)

Conclusion ⟵ (last column)

Due to the logic table including rows where all premises were true and the conclusion was true, the argument is valid.

3.

a. False, because, if x and y were 100. Then you get $(100 == -101)$ or $(100 < 100)$ = False.

b. False, because if x is 100, there is no y value that can satisfy $(y == -x-1)$ or $(x < y)$

c. True, either condition can be true if the other can not. Ex! $(50, 100) \rightarrow (100 == -51)$ or $(50, 100)$

d. True, there exist numbers for x and y in the domain that will always satisfy the statement

4. $n \bmod 7 = 4$ then $(n^2 + 2n - 5) \bmod 7 = 5$

$n = 11_q + 4$

$11 \bmod 7 = 4$ then $(121 + 22 - 5) \bmod 7 = 5$

$((7_q + 4)^2 + 2(7_q + 4))$ $138 \bmod 7 = 5$

$((n = 18$

$18 \bmod 7 \neq 4$ then $(324 + 36 - 5) \bmod 7 = 5$

$355 \bmod 7 = 5$

5.

p	q	r	w	t	s	u
F	T	F	T	F	F	T

$p \lor q = T$

$p \rightarrow r = T$

$w \lor t = T$

$\sim r = T$

$q \rightarrow (s \land u) = T$

$t \rightarrow \sim s = T$

$\therefore w = T$

With this row of the truth table,
the conclusion is valid, because all
premises are true and the conclusion
is true