MTH 301
Quiz 1
Spring 2018

20 points possible.

1. (4 pts.) Construct the truth table for both of the following statement forms. You may put them both in the same table. Then determine whether the forms are logically equivalent. Include a sentence justifying your answer. Your sentence should show that you understand the meaning of logical equivalence.

$$(p \vee q) \wedge r \quad \text{and} \quad p \vee (q \wedge r)$$

2. (2 pts.) Write the negation for the following statement. (Assume the variable represents a fixed entity.)

If Q is a triangle, then Q is a polygon.

3. (3 pts.) Write the negation for the following statement.

$\forall$ real numbers x, if $x > 5$ then $x^2 > 25$.

4. (3 pts.) Consider the following statement.

$(*)$ $\exists x \in \mathbb{Z}$ such that $x^3 > 10$.

(a) Is the following statement an equivalent way of expressing statement $(*)$?

If x is an integer, then $x^3 > 10$.

(b) Is the following statement an equivalent way of expressing statement $(*)$?

The number x has cube greater than 10, for some integer x.

(c) Is the following statement an equivalent way of expressing statement $(*)$?

The cube of each integer is greater than 10.

5. (6 pts.) State whether each argument is valid or invalid. (No justification needed.)

(a) If I bake a pie, then my sister will get a stomachache.

I didn't bake a pie.

$\therefore$ My sister will not get a stomachache.

(b) All professors are absent-minded.

Tom Hutchins is not absent-minded.

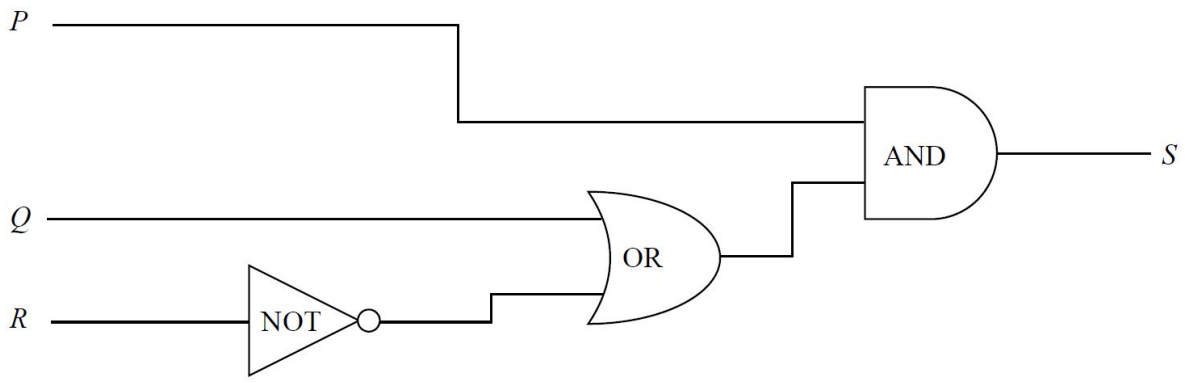
$\therefore$ Tom Hutchins is not a professor.

(c) No healthy people are sophomores.

No sophomores are honest.

$\therefore$ No healthy people are honest.

6. (2 pts.) Give the output signal for the circuit if the input signals are as indicated.



input signals: $P = 1$, $Q = 0$, $R = 1$