Recitation 1

- The best way to learn the material in 310 is to solve problems on your own!
- Here is a set of practice problems. They range from being very easy to very tough. Feel free to ask (and answer) questions about these problems on Piazza, or amongst yourselves.
- The TAs will lead discussions on these problems during recitation.

- While you don't have to turn your work in for grading, be warned that this material **can** appear in a quiz or exam.

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1. Which of the following sentences is a proposition? Justify your reasoning.

    (a) 1,024 is the smallest four-digit number that is a perfect square.

    (b) Who among you is a mathematics major?

    (c) $128 = 26$.

    (d) $x = 26$.

2. Let h = "John is healthy", w = "John is wealthy", and s = "John is wise". Express the following in symbolic form.

    (a) John is healthy and wealthy but not wise.

    (b) John is not wealthy but he is healthy and wise.

    (c) John is neither healthy, wealthy nor wise.

3. Write the truth table for

    $(p \lor (\neg p \lor q)) \land \neg(q \land \neg r)$

4. This is a 2-part question.

    (a) Show that the following 3 statements are logically equivalent:

    $$p \implies q \lor r \qquad p \land \neg q \implies r \qquad p \land \neg r \implies q$$

    (b) Using the logical equivalences above, rewrite the following sentence in two different ways (assume that n here represents a fixed (and known) integer). "If n is prime, then n is odd or n is 2."

5. **(5 points)** Describe a simple algorithm which, given a positive integer n, produces a width n array of truth values whose rows would be all the possible truth values for n propositional variables. For example, for $n=2$, the array would be:

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|  |  |
| -| -|
| T| T|
| T| F|
```

```
|F|T|
|F|F|
```

Your description of the algorithm can be in pseudocode, or in a familiar programming language like Java, Python, or C++.