CSCI 301, Winter 2021
Math Exercises #1

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- Answer all of the questions.
- Leave the questions in place; it makes grading easier.
- Add and commit your `homework-1.tex` to your git repository. **Do not** add and commit generated files like `homework-1.pdf` or `homework-1.log`. Consider a `make clean` before using git.
- Show your work and explain your answer. If the answer is an integer, I need to know how you got it.
- Remove this itemized list.

1 Explicitly write out the contents of the following set:

$$\{X \in \mathscr{P}(\{1,2,3\}) : 2 \in X\}$$

Answer
X is an element of the power set of set {1,2,3} where 2 is an element of X

2 Negate the following statement:
If x is a rational number and $x \neq 0$, then $\tan(x)$ is not a rational number.

Answer
$\sim (x \in Q) \cup (x = 0) \Rightarrow tan(x) \in Q$

3 Compute how many 7-digit numbers can be made from the digits $1,2,3,4,5,6,7$ if there is no repetition and the odd digits must appear in an unbroken sequence. Examples: 3571264 or 2415376 or 2467315, but not 7234615.

Answer
{1,3,5,7}is 4!,{{1,3,5,7},2,4,6} is also 4! so $4!^2 = 576$

4 This problem concerns 4-card hands dealt off a standard 52-card deck. How many 4-card hands are there for which all 4 cards are of different suits or all 4 cards are red?

Answer
let S be the cards of different suits and R be the red cards.
$S \cap R = \emptyset$
So
$|S + R| = |S| + |R|$
and
$|S| = 13^4$, *while* $|R| = \binom{26}{4}$
$13^4 + \binom{26}{4} = 43511$