CSU Math 366

# Homework 3

Due Friday, March 12, anytime, on Gradescope.

**Remark.** Your answers should be briefly explained. If you're only writing math symbols, then you're not explaining things — make grammatically correct sentences by adding in just a few English words. For example, suppose the assigned problem were "Solve $x^2-3x+2=0$." The answer

$$\text{“}x^2-3x+2=0 \qquad (x-1)(x-2)=0 \qquad x=1 \text{ or } x=2,\text{”}$$

would not make me 100% happy, but the following answer would:

"Since $x^2-3x+2=0$ implies $(x-1)(x-2)=0$, we have $x=1$ or $x=2$."

Note we added only four English words.

**Reading.** Read Chapters 5 and 6, and only if you are interested, also 7 and 8.

**Problems.**

1. **Section 4.5, #3(c).**

   (c) List all of the elements in each of the subgroups of $\mathbb{Z}/12\mathbb{Z}$. You should have 6 subgroups in total, including both the trivial subgroup $\langle 0\rangle = \{0\}$, and including also $\mathbb{Z}/12\mathbb{Z}$ itself.

2. **Section 4.5, #5.** Find the order of every non-identity element in $\mathbb{Z}/18\mathbb{Z}$. That is, for each element $a \in \mathbb{Z}/18\mathbb{Z}$, find the smallest integer $k$ such that $a$ added to itself $k$ times is equal to the identity 0. For example, the order of $a=1$ is 18, and the order of $a=2$ is 9.

3. **Section 5.4, #1(a)(b).** Write the following permutations in cycle notation.

   (a) $f(1)=2, f(2)=4, f(3)=1, f(4)=5, f(5)=3$.

   (b) $f(1)=4, f(2)=2, f(3)=5, f(4)=1, f(5)=3$.

4. **Section 5.4, #2(c)(d).** Compute each of the following.

   (c) $(143)(23)(24)$

   (d) $(1423)(34)(56)(1324)$

5. **Section 5.4, #3(a)(b).** Express the following permutations as products of transpositions and identify them as even or odd.

   (a) $(14356)$

   (b) $(156)(234)$