CMSC 250 - Exam #1 – Fall 2015 – General Rules

If we can not read your answer, it will be graded as incorrect.

Show all work. Justify all steps in proof questions. Details matter!
If we do not see work, we may grant no credit for that question.
Correct answers with missing or incorrect justifications will lose points and might get none.

This exam is individual work, closed-book, closed-notes, and no-calculators or other electronic devices.

In proofs, once a logical error occurs, there will probably not be any partial credit given for the remainder of
the attempted answer to that question. Not all questions will have partial credit available.

There will be problems where you will need to decide whether the statement is true or false and then
formally prove or disprove the statement as appropriate. “Proving” true things false or false things true will
typically lead to the loss of most if not all points available on that problem.

Please place a box around your final answer where appropriate to make it easier to grade.

For certain problems you will be told you can use any of the following as long as you state what you are
using as you use it. No other theorems proven in books or in class may be used without proving them again.

The definitions of even, odd, rational, prime, composite, divisibility, and mod (though you must state
which definitions you use).

n being even means $\exists k \in \mathbb{Z}$ such that $n=2k$

n being odd means $\exists k \in \mathbb{Z}$ such that $n=2k+1$

r being rational means $\exists r,s \in \mathbb{Z}$ such that $n=r/s$ and $s\neq 0$

n being prime means $n>1$ and $\forall r,s \in \mathbb{Z}^\ast$ (n=rs) $\to$ (r=1 or s=1)

n being composite means $n>1$ and $\exists r,s \in \mathbb{Z}^\ast$ $r\neq 1$ and $s\neq 1$ and $n=rs$

if n and d are integers and $d\neq 0$ then $d|n$ means $\exists k \in \mathbb{Z}$ st $n=d\cdot k$

$p\equiv x \pmod{q}$ is the same as $x|(p-q)$

The fact that every integer is even or odd but not both and that consecutive integers have different
parity and the rules about closure of integers under addition, subtraction, and multiplication.

I am not sure yet whether you'll be allowed to use Unique Prime Factorization on this exam, but either way
the fact that the square root of 2 is irrational may be used if needed.

Remember that for a counter-example proof you need to not only give the counter example but also do the
formal proof that it is a counter-example and that for any proofs relating to divisibility or non-divisibility,
you have to show the math through using the techniques we have seen in class and posted problems.

If the statement is given in natural language form, you must correctly express it as a formal statement and
then prove or disprove that statement. If you do not correctly express it, the entire answer will likely be
marked as incorrect.