Proof Portfolio Problem 3

Chose one problem from each numbered group. For example, choose only one of 3A, 3B, and 3C.

Remember that no collaboration among students is permitted and no outside resources are allowed. This is a wholly individual effort. This means, no talking with others in our class (even about what problem you are doing!), or outside of our class (friends, other professors etc). It also means you can not use resources besides our text, class notes, and course YouTube channel. The goal here is for you to become competent in proof writing and confident in your ability in your future courses. Please see me when you need support.

Remember to see the directions for what to do with conjectures that are false.

SPECIAL INSTRUCTIONS FOR BICONDITIONAL STATEMENTS: If one of the conditional statements is true and one is false, you may correct the conjecture by stating the true conditional statement. You should provide a counterexample for the incorrect conditional statement and a proof of the correct one. Your corrected theorem statement need not be a biconditional statement.

Conjecture 3A. For every integer a, $a \equiv 2 \pmod 6$ if and only if $a^2 \equiv 4 \pmod 6$.

Conjecture 3B. For all integers m and n, $mn \equiv 0 \pmod{10}$ if and only if $m \equiv 0 \pmod{10}$ or $n \equiv 0 \pmod{10}$.

Conjecture 3C. For all integers c and d, $45 \mid cd$ if and only if $45 \mid c$ or $45 \mid d$.