321 Section, 2-7

Natalie Linnell

Prove or disprove that if a, b, c are positive integers and $a|bc$ then $a|b$ or $a|c$

How many zeros are there at the end of 100!

Prove that if n is an odd positive integer, then $n^2 \equiv 1 \pmod{8}$

Use Fermat's Little Theorem to compute 3^{302} mod 5

Prove that if p is prime, and $x^2 = 1 \pmod{p}$ then $x \equiv 1 \pmod{p}$ or $x \equiv (p-1) \pmod{p}$

Prove that if m and n are both perfect squares, then nm is a perfect square

- What kind of proof did you do?

Prove that if 3n+2 is odd, then n is odd

- What kind of proof did you do?

Show that the following is a tautology using a truth table

- $((r \rightarrow (p \vee q)) \rightarrow (\neg p \rightarrow (r \rightarrow q))$

Let $D(x,y)$ mean "team x defeated team y" and $P(x,y)$ mean "team x has played team y"

- Every team has lost at least one game.

- There is a team that has beaten every team it has played.

True or false: $a \equiv b \pmod{m}$, and $b \equiv c \pmod{m}$ implies that $a^2 \equiv bc \pmod{m}$

Is the argument correct? Why?

- Every computer science major takes discrete mathematics. Natasha is taking discrete mathematics. Therefore, Natasha is a computer science major.

- Everyone who eats granola every day is healthy. Linda is not healthy. Therefore, Linda does not eat granola every day.

Show that $((p \vee q) \wedge \neg p) \rightarrow q$ is a tautology using logical equivalences