Discussion #4

Contrapositives

If statement A, then statement B.

Contrapositive:

If NOT Statement B, then NOT Statement ~~B~~ A.

Example: If ~~I~~ you drive the 60 freeway westbound (Statement A), then ~~...~~ you will be in Los Angeles (Statement B).

Contrapositive:

If you will not be in Los Angeles, then you do not drive the 60 freeway westbound.

Converse:

If you will be in Los Angeles, the you drive the 60 freeway westbound.

Inverse:

If you do not drive the 60 freeway westbound, then you will not be in Los Angeles.

Converse:

If Statement B, then Statement A.

Inverse:

If NOT Statement A, then NOT Statement B.

Ex: Let ~~a~~ a, b, n be integers. If ab is ~~not a multiple of n,~~ Not an integer multiple of n, then a is not ~~a~~ multiple of n and b is NOT a multiple of n.

Contrapositive:

The negation of "and" is "or", because of De Morgan's Law (MATH 144)

If a is a multiple of n, or b is a multiple of n, then ab is a multiple of n.

Proof: (of Contrapositive):

- Suppose a is an integer multiple of n. Then there exist an integer k ~~such~~ that satisfies

$$a = kn.$$

So we have $ab = (kn)b$

$= \cancel{}.\ n(kb)$

Since $\cancel{ab}$ kb is also an integer, we conclude that ab is an integer multiple of n.

- Suppose b is an integer multiple of n. Then there exist integer l that satisfies $\cancel{b=kn}$. $b=ln$

So we have $ab = a(ln)$

$= n(al)$

Since al is also an integer, we conclude that ab is an integer ~~mult~~ multiple of n.