

Four of these problems will be graded (our choice, not yours!), with each problem worth 5 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but you must write up your own final submission without reference to any sources other than the textbook and instructor.

1. Do the WeBWorK “Implication” assignment, available via

<https://webwork.coe.edu/webwork2/MTH-215/>

2. Do the WeBWorK “Truth Tables” assignment, available via

<https://webwork.coe.edu/webwork2/MTH-215/>

3. Score at least 6 out of 7 on the Truth Tables Gateway on WeBWorK, available via

<https://webwork.coe.edu/webwork2/MTH-215/>

4. The statements $\neg(P \wedge Q)$ and $\neg P \vee \neg Q$ are logically equivalent. [DeMorgan’s Law]
5. A statement and its inverse are logically equivalent.
6. A statement and its contrapositive are logically equivalent.
7. The statements $P \wedge (Q \vee R)$ and $(P \wedge Q) \vee R$ are logically equivalent.
8. The statements $P \wedge (Q \vee R)$ and $(P \wedge Q) \vee (P \wedge R)$ are logically equivalent.
9. $\sqrt{3}$ is irrational.
10. The product of a non-zero rational and an irrational number is irrational.
11. Critique the following proof of the proposition:

Proposition: Let $p \in \mathbb{Z}$. If $2 \mid p^2$, then $2 \mid p$.

Proof: Assume $2 \nmid p$, i.e., $\exists n \in \mathbb{Z}$ such that $p \neq 2n$. So p must be odd. $\forall m \in \mathbb{Z}$, $p = 2m + 1$. Now $p^2 = (2m + 1)^2 = 4m^2 + 4m + 1$ is odd because of the +1 and not even, so $2 \nmid p^2$.

12. $\forall n \in \mathbb{Z}^+$,

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$