Problem Set 3: Discrete Mathematics

1. Using proof by contrapositive to show that "If $m - n$ is even, where m and n are integers; then, either m and n are both odd, or m and n are both even."

2. Using proof by contrapositive to show that "for all integers m and n, if the product of m and n is even, then m is even or n is even."

3. Use Proof by Contrapositive to show that "If $(x + 3)^2.(x - 3) + 12$ where x is natural number is an odd integer, then x must be an even integer."

4. Prove that "If a number added to itself gives itself, then the number is 0."

5. Prove that "For all real numbers x and y, if $x + y \geq 2$, then either $x \geq 1$ or $y \geq 1$."

6. Using proof by contradictions to show that "The sum of even integers is even."

7. Prove that for all positive integers a, b, and c; if $a^2 + b^2 = c^2$, then at least one of a, b, or c must be even.

8. Prove that for some positive integer x, $x + 1/x \geq 2$.

9. Prove that there are no integers a and b for which $18a + 6b = 1$.

10. Use proof by contradiction to show that $(A \cap B) = \emptyset \Rightarrow A \subseteq B^c$