# ECS20
## Midterm2: Review problems

**Exercise 1:**

Construct a truth table for the proposition $(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$

**Exercise 2:**

Prove that the square of an even number is an even number using:
   (i)     a direct proof
   (ii)    an indirect proof
   (iii)   a proof by contradiction

**Exercise 3:**

Prove or disprove that the product of a non zero rational number and an irrational number is irrational.

**Exercise 4:**

Prove that if x and y are real numbers, then $max(x,y)+min(x,y)=x+y$. (Hint: use a proof by cases, with the two cases corresponding to $x \geq y$ and $x < y$, respectively)

**Exercise 5:**

Show that the product of two of the numbers $65^{1000}-8^{2001}+3^{177}$, $79^{1212}-9^{2399}+2^{2001}$, and $24^{4493}-5^{8192}+7^{1777}$ is nonnegative. Is your proof constructive or non constructive? (Hint: do not try to evaluate these numbers!)

**Exercise 6:**

Let A, B and C be sets. Show that:
a) $(A \cup B) \subset (A \cup B \cup C)$
b) $(A - B) - C \subset A - C$
c) $(B - A) \cup (C - A) = (B \cup C) - A$