Exercise 2

1. If $p \rightarrow q$ is false, what is the truth value of $((\neg p) \wedge q) \leftrightarrow (p \vee q)$

2. Let p, q and r be the proposition

   p: you get an A on the final exam

   q: you do every exercise in this book

   r: you get an A in this class

   Write these propositions using p, q and r and logical connective

   i) You get A in this class, but you do not do every exercise in this book

   ii) To get an A in this class, it is necessary for you to get an A on the final

   iii) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class

3. Write the predicate and quantifier represent the following sentence. Domain of discourse is all people

   i) Some of my friends are clever.

   ii) All clever people are either boring or wealthy.

4. Write a sentence represent the negation, $\neg p$ of the following predicate

   i) p: some people like discrete structure

   ii) p: all people in my class are tall and thin

5. Base on the propositions p, q and r, rewrite the given statements using logic symbols.

   p : Power button is on

   q : Computer shuts down

   r : Computer displays start screen

   i) Computer displays start screen only with the condition that the power button is on.

   ii) If the power button is on then the computer does not shuts down or displays start screen.

iii) Once the power button is off, it is either the computer shuts down or does not displays start screen.

6. State the truth value for the given compound propositions below provided the truth values for p and r is FALSE and q is TRUE.
   i) $(p \rightarrow \neg q) \wedge \neg (r \vee q)$
   ii) $(\neg p \wedge \neg q) \rightarrow (p \vee \neg r)$
   iii) $\neg(\neg p \leftrightarrow \neg q) \wedge r)$

7. Let $P(x,y)=(x*y)^2 \geq 1$. Given the domain of discourse for x and y is set of integer, Z. Determine the truth value of the following statements. Give the value of x and y that make the statement TRUE or FALSE.
   i) $\exists x \exists y\ P(x,y)$
   ii) $\forall x \forall y\ P(x,y)$

8. Use truth table to check if the compound propositions A and B are logically equivalent.
   $A = (\neg p \vee q) \rightarrow r$
   $B = \neg q \leftrightarrow (\neg p \vee r)$

9. Simplify the following compound propositions using Laws of Logic.
   $(a \vee b) \wedge \neg (\neg a \wedge b)$

10. Prove the following compound proposition using logical law.
    $(P \vee \neg Q) \vee (R \wedge (Q \vee \neg Q)) \equiv R \vee (P \vee \neg Q)$

11. Proof directly that,
    "If m is an even integer and n is an odd integer then $m+n$ is an odd"