

# Homework Assignment 1

## Exercise 1

We define functions mapping  $\mathbb{R}$  into  $\mathbb{R}$  as follows:

$f(x) = x^3 - 4x$ ,  $g(x) = 1/(x^2 + 1)$ ,  $h(x) = x^4$ . Find

- (a)  $f \circ f$                       (b)  $g \circ g$                       (c)  $h \circ g$   
(d)  $g \circ h$                       (e)  $f \circ g \circ h$                       (f)  $f \circ h \circ g$   
(g)  $h \circ g \circ f$

## Exercise 2

Form the contrapositive of these statements:

1. If you don't take the final examination, you will get an F for the course.
2. If a quadrilateral is a rectangle, it has 4 equal angles.
3. If a triangle has either two equal sides or two equal angles, then it is an isosceles triangle.

## Exercise 3

. Find the related forms for the Universal Conditional Statement:

**Every integer that is greater than 1 has a unique prime factorization.**

CONVERSE:      INVERSE:      CONTRAPOSITIVE:      NEGATION:

## Exercise 4

Decide whether the following statements are tautologies or contradictions or neither.

1.  $(p \rightarrow q) \vee (q \rightarrow p)$ .
2.  $(p \wedge q) \vee (q \rightarrow \neg p)$ .
3.  $(p \vee \neg q) \rightarrow (q \wedge \neg p)$ .

### **Exercise 5**

• Let  $A = \{d, i, s, c\}$  and  $B = \{r, e, t\}$  and  $U = \{a, c, d, e, h, i, m, r, s, t\}$

- (a) Find  $A \times B$       (b) Find the Power Set of  $B$       (c) Verify the  $(A \cup B)^c = A^c \cap B^c$