COMP9020 - Assignment 3

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Question 1

On the left side:

$\binom{n}{k} = \frac{n!}{(n-k)!k!} = \frac{\frac{n!}{(n-k)}}{(n-k-1)!k!}$

$\binom{n}{k+1} = \frac{n!}{(n-k-1)!(k+1)!} = \frac{\frac{n!}{(k+1)}}{(n-k-1)!k!}$

$\binom{n}{k} + \binom{n}{k+1} = \frac{\frac{n!}{(n-k)} + \frac{n!}{(k+1)}}{(n-k-1)!k!}$

On the right side:

$= \frac{\frac{(n+1)n!}{(n-k)(k+1)}}{(n-k-1)!k!} = \frac{\frac{(n+1)!}{(n-k)(k+1)}}{(n-k-1)!(k)!}$

$\binom{n+1}{k+1} = \frac{(n+1)!}{(n-k)!(k+1)!} = \frac{\frac{(n+1)!}{(n-k)(k+1)}}{(n-k-1)!(k)!}$

Therefore, left side is equal to right side

Question 2

(a) let set X = $\{p, \neg p, q\}$
let set Y = $\{\wedge, \vee\}$
without using parenthesis, formulas can be constructed like this:
X1 Y1 X2 Y2 X3
the choices is:
$3! \times 2! = 12$
if we use 1 pair of parenthesis, we can put it there:
(X1 Y1 X2) Y2 X3
X1 Y1 (X2 Y2 X3)
(X1 Y1 X2 Y2 X3)
if we use 2 pairs of parenthesis, we can put them there:

((X1 Y1 X2) Y2 X3)
(X1 Y1 (X2 Y2 X3))
add up them together, there are $1 + 3 + 2 = 6$ methods to put parenthesis
therefore, there are $12 \times 6 = 72$ different wff.

(b) there are 6 logical equivalence, as follows:
$X \vee p$
$X \vee q$
$X \vee \neg p$
$X \wedge p$
$X \wedge q$
$X \wedge \neg p$
X is the combination of the other 3 symbols, based on Commutativity, X is unique.

Question 3

(a)

Question 4

(a)

Question 5

(a)