1.6

Exercise 4

(a)
p:Kangaroos live in Australia
q:Kangaroos are marsupials

$$\frac{q \wedge p}{\therefore q}$$

(b)
p: it is hotter than 100 today.
q: the pollution is dangerous.

$$\frac{\begin{array}{c} p \vee q \\ \neg q \end{array}}{\therefore q}$$

(c)
p:Linda is an excellent swimmer.
q: Linda can work as a lifeguard.

$$\frac{\begin{array}{c} \text{p} \\ p \rightarrow q \end{array}}{\therefore q}$$

(d)
p:Steve will work at a computer xompany this summer.
q:He will be a beach bum.

$$\frac{\text{p}}{\therefore p \vee q}$$

(e)
p:i work all night on this homework.
q: I can anser all the exercise.
r: I will undersatnd the material.

$$\frac{\begin{array}{c} p \rightarrow q \\ q \rightarrow r \end{array}}{\therefore p \rightarrow r}$$

Exercise 24

$\forall x(P(x) \vee Q(x))$ is true so $\forall x P(x) \vee Q(x))$ is true
following the step 1, i can get permise is $\forall x(P(x) \vee Q(x))$
use universal instantiation get $P(c) \vee Q(c)$

and then we can get the step 3 is error, if the step 3 is error the step 5 also is error too.
and the step 7 conjunction should be $\wedge$
answer: the step 3,5 and 7 are error.

1.7

Exercise 6

let use x and y to be two odd integers.
x=2m+1
y=2n+1
x*y=(2m+1)*(2n+1)
=4mn+2m+2n+1
=2(2mn+m+n)+1
x*y=2z+1(z is a even integers)
so product two odd number is odd.

Exercise 20

(1)
if 3n+2 is even integer then n is even.
so we can get $p \to q$ and $\neg q \to \neg p$
p:n and 3n+2 is even
$\neg p$: 3n+2 are not even
q:n is even
$\neg q$: n is odd

(2)
if n is odd that meaning n=2x+1
3n+2=3(2x+1)+2
=6x+3+2
=6x+5
=6x+4+1
=2(3x+2)+1 is odd

so (3n+2) is odd, so if (3n+2) is even the n maut be even.

1.8

Exercise 6

min(a,min(b,c))=min(min(a,b)c)
(1)
$a \leq min(b,c)$ if a a is the smallest $a \leq b$ or $a \leq c$
min(a,b)=a
min(min(a,b),c)=min(a,c)=a

(2)
if $b \leq a$ and $b \leq min(b,c)$
$a \leq b$ or $a \leq c$
min(a,b)=b
min(min(a,b),c)=min(b,c)=b

(c)
c is same with a and b the min(a,min(b,c))=min(min(a,b),c)

just depend on the which one number is smalest.

Exercise 20

$x < r < x+1$
$|x-r| < 1/2$ or $|(x+1)-r| < 1/2$
if $|x-r| < 1/2$, we can choose n=x
if $|(x+1)-r| < 1/2$ we can choose n=x+1
$|r-y| < 1/2$
$|n-y| \leq |n-r| + |r-y| = |n-r| + |y-r| = 1/2 + 1/2 = 1$
n=y
so r is an irrational number and less than 1/2 with n