1.

220.33.0.0 /16

220.33.0.0 AND 255.255.0.0

220.33.0 0

220.33.128.0 AND 11111111.11111111.1110 0000.0000 0000

220.33.128.0   /60

22.33.148.0/22

a) 220.33.0.0/16 Matches 220.33.150.2
   220.33.128.0/19 Matches 220.33.150.2
   220.33.148.0/22 Matches 220.33.150.2
   Longest prefix match is 220.33.148.0/22

   So destination ip is 220.33.140.2

b) 220.33.0.0/16 Matches 220.33.156.2
   220.33.128.0/19 Matches 220.33.156.2
   220.33.148.0/22 Does Not Match 220.33.156.2
                    /22

   220.33.148 AND 255.255.11111100.0

   148 = 1001 0100
         1111 1100
         1001 01xx
            ↓
   156 = 1001 11
          Doesn't Match

   Longest Prefix Match: 220.33.128.0/19
     Next Destination: 220.33.128.1

c. 220.33.0.0/16 matches 220.33.164.3

220.33.128.0 AND 255.255.1110 0000.0

$128 = 1000\ 0000$
$\underline{1110\ 0000}$ - Bit mask
$100\ x\ xxxx$

$164 = \underline{1\ 01\overset{\uparrow}{}}$
Doesn't match

∴ wasn't match 220.33.148.0 either
because .148 is more specific than .128

220.33.128.0/19 Does NOT Match 220.33.164.3
220.33.148.0/22 Does NOT Match 220.33.164.3

choose longest prefix Match: 220.33.0.0/16
Next Destination: 220.33.0.1

d. 220.77.170.4

220.33.0.0 AND 255.255.0.0

220.33. X . X
has to start with 33
220.77.170.4 Does NOT
Therefore it goes to default route:
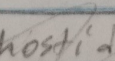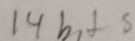0.0.0.0/0
Next Destination: 220.33.2.1

2. Supernet: 199.77.32.0

a)

$$\# \text{ Class C block} = \frac{2^{32-19}}{2^8} = 2^{13-8} = 2^5 = 32 \text{ blocks}$$

199.77.55.1 AND 255.255.224.0

55 = 0011 0111
     1110 0000
     _____
     001x xxxx = 32 so,
     199.77.32.0

32 - 8 = 24 netid
24 - 19 = 5 bit positions
2^5 = 32 blocks

b)   180.170.80.70 AND 255.255.224.0

80 = 0101 0000
     1110 0000
     _____
     010x xxxx = 64
Subnet Address: 180.170.64.0

net | all 1s | Directed Broadcast for net
14 bits

180 = 10 ... Class B

netid | hostid | all 1s

180.170.64.0 AND 255.252.224.0

64 = 010|0 0000
     xxx 11111
     _____
     010 11111 =
180.170.95.255

Individual host Range:
+1 from subnet address
-1 from directed broadcast address

$\{180.170.64.1 - 180.170.95.254\} =$
Range of IP address for individual hosts

3, P1: 75 hosts $0xxx\ xxxx$
   $2^7 - 2 = 126 > 75$ Address: 200.55.66.0/25

D2: 125 host $1xx\ xxxx$
   $2^7 - 2 = 126 > 125$ Address: 200.55.66.128/25

P3: 42 hosts $11xx\ xxxx$
   $2^6 - 2 = 62 > 42$ Address: 200.55.66.192/26