2.

a.

When a host let say "A' wants to communicate to a host "B" (both being in network 1); Initially, "A" needs to check if "B" is in the same network, for this AND operation is done with IP address of "B" with subnet mask of the network 1 (i.e, the one in which source "A" is present), let it be Nb1. Then AND operation is done between subnet mask of network 1 and IP address of "A" giving Na1 (i.e., Network ID of network 1).

Now, As both "A" and "B" are in the same network  Nb1 will be equal to Nb1. Now, using ARP request MAC address of "B" would be obtained and the data packets would be sent from "A" to "B".

b.

let, the sender node be denoted as "A" and the receiver node as "B". Now, "A" wants to send data to "B", for this first "A" would check if "B" is present in the same network or not, for this Subnet mask of network 1 (i.e., the one in which "A" is present) is used. AND operation between IP address of "A" and subnet mask of network 1 gives Na1; Similarly, AND operation between the IP address of "B" and subnet mask of network 1 gives Nb1.

Now, since they aren't in the same network Na1 will not be equal to Nb1.

Then, "A" would set the destination MAC address in the header to be that of default gateway ie., the router, then the packet would be sent to the router. Then that router would broadcast ARP request by setting the IP address of "B" in the header of the ARP packet, if it doesn't get a reply then again it would forward the packet to default gateway i.e., the next router. Then, this process of broadcasting ARP request with ARP header containing the IP address of "B" would continue, if not found it would be sent to the default gateway. (But this process would not be continued forever as time to live would become 0, leading to packet getting discarded, as the max number of hops is 16 in case of IPv4).

Now, in this case as after 3 hops the packet would be with the router of the network in which "B" is present, then the router would send ARP request and get ARP unicast reply from "B", now router would set the MAC address of "B" in the header of the packet and sent it; Then the packet would reach the destination "B".