3. a) If and then .

According to the definition of O, there exist positive constants such that for all and there exist positive constants such that for all .

Adding the two functions together gives us:

In O notation, we can ignore the constants as we are concerned with the asymptotic bounds of the function as n gets significantly large. Since our statement is already in the form of the definition of O, we can say when and .

b) If and then

According to the definition of O, there exist positive constants , and such that and for all .

According to the definition of , there exist positive constants , and such that .